THE MARINE REVIEW

VOL. 39. CLEVELAND, MARCH 25, 1909. NEW YORK No. 12

Dry Dock at Pearl Harbor.

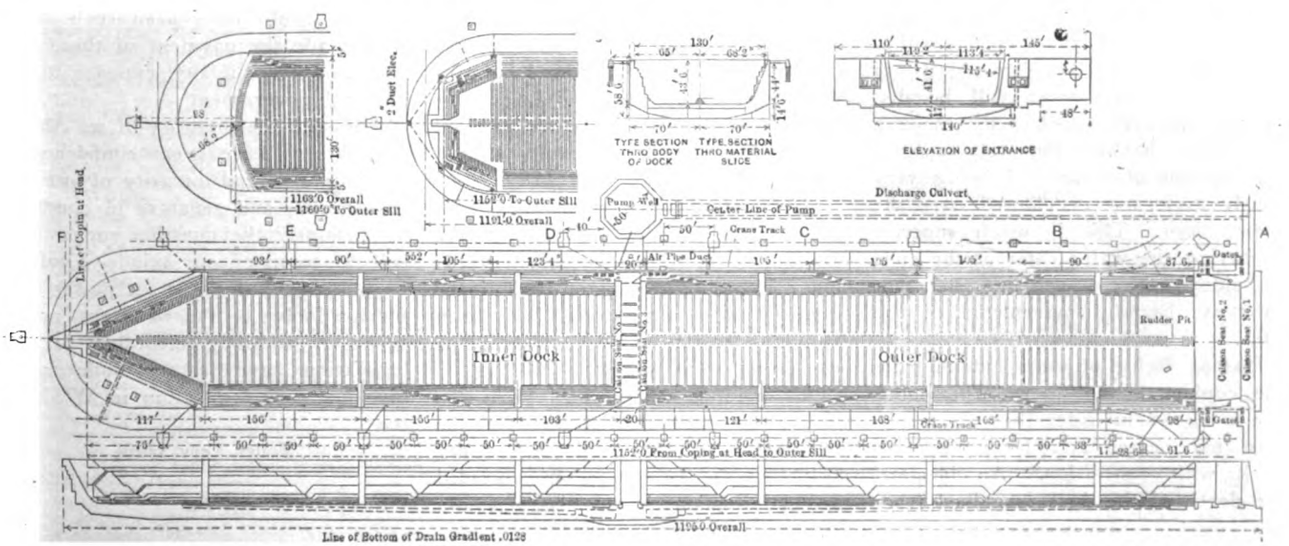
The dry dock at the naval station, Pearl harbor, Hawaii, is to be the largest ever constructed by the navy department. Its overall length is 1,195 ft., whereas the longest dock previously constructed is at Philadelphia, 799 ft. overall. The Puget Sound dry dock recently contracted for is 863 ft. overall.

An innovation, so far as American docks are concerned, is that there will be four caisson seats, two as usual at the entrance to the dry dock and two others near the middle of the dock, dividing the main structure into an inner and outer dock. There will be two steel caisson gates and the arrangements will be such that with a ship in the inner dock the outer dock may be filled and emptied independently, thus allowing the ship upon which the most extensive repairs are to be made to remain in the inner dock while ships with minor repairs are being docked in rapid succession in the outer dock. By floating the inner caisson from the dry dock, ships of greater length than any now in existence or planned could be docked.

A trapezoidal form of head has been designed for this dock different from any hitherto considered. It is so arranged that three destroyers may be docked side by side extending to the very head of the dock, leaving room for three other small craft in the inner dock. Bids will also be received for the usual forms of V-shaped head and arched head.

The draught over sill at mean high water will be 35 ft., which is more than any other dock excepting the one at Puget Sound where the great variation in tides required a draught of 38 ft. The conditions of tide at Pearl harbor are such that the largest battleship may enter the dock at any stage of the tide. Concrete will be used throughout in the walls and floor Granite lining will be used only at caisson seats and the coping at entrance and material slides. The conditions for the use of concrete are believed to be more favorable at Pearl harbor than at any point in the United States on account of the equable climate and absence of frost.

A marked improvement over all previous docks has been developed in connection with the dock for Pearl harbor, in that the working floor will be absolutely level from end to end, giving a level working surface, free from the usual obstructions, such as bilge-block slides, docking keel block bearers, bilge block chains, temporary electric wires, temporary compressed air lines, etc. The attempt has been made many times previously to accomplish this object but never with success. It has been ac-



PLAN OF PROPOSED DRY DOCK AT PEARL HARBOR.

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complished in this case by an entirely new design for bilge block bearers and docking keel block bearers. The bearers are made in the shape of cast iron boxes embedded in the dock floor with top flush with the concrete. The wide flanges on the top form the bearers for the keel blocks and bilge blocks and a slot is provided through the top of the box to take the anchor bolts for keel blocks and the holding-down device for the bilge blocks. The cast iron box is large enough also to take the chains for the hauling of bilge blocks across the floor of the dock while a ship is being placed.

Another most important function of the cast iron boxes is to drain the floor. The water passes through slots and flows along the sloping bottom of the boxes and is discharged into four large longitudinal sub-floor drains. These, in turn, carry the water into the drainage chambers near the middle of the dock. The inner dock and outer dock each have an independent system of longitudinal drains and a drainage chamber. Three 54-in. pipes with gate valves pass from each drainage chamber into a common wet chamber outside of the dry dock structure. The four 54-in. suction pipes from the pump well, which is close by, open into the wet chamber, thus removing water which flows in from either one or both of the dry docks. The slots, cast iron boxes and drains have been so designed that the velocity of water while being pumped will be sufficient to remove any silt which may have collected.

The system of cast iron boxes with slots and longitudinal floor drains will also be used for filling the dock. Four filling culverts, two on each side of the dry dock having inlets in the quay-wall at the entrance of the dock, are connected with the longitudinal drains in the inner and outer docks in such a manner that either dock may be filled independently of the other. The water will be discharged into the dock body through the slots having thus an upward velocity on entering and being very nearly uniformly distributed over the entire floor. This is much superior to having the water enter at the ends or sides with a velocity sufficient to cause harmful movements of the ship.

Sixteen flights of stairs extend from the coping to the floor. This number is liberal in order that the workmen may enter and leave the dry dock with expedition. An idea of the depth of the dock is gained from the fact that it will take 65 steps to go from the floor to the coping. The stairways have been so designed that the altars are not interrupted, but pass around the stairs with slightly reduced width. The design is similar to that previously used in dry dock No. 2 at Philadelphia.

There will be 539 keel blocks extending from the entrance to the head of the dry dock. These are for the purpose of carrying the weight of the ship when the dock is pumped. Two lines of docking keel blocks will extend on either side of these to take the weight of turrets, etc., of battleships.

The pump well will be located near the middle of the dock and about 30 ft. away. It will be of octagonal shape and contain four 54-in. pumps. In addition to the four suction pipes which lead to the wet chamber of the dock to be built at the present time, short ends of pipe will be built in the masonry so that a second dry dock may be pumped by means of the same pumps. The discharge from the pumps will be carried in a discharge culvert leading to the bay. The general dimensions of the dry dock will be as follows:

Overall length	1,195 ft.
Width between coping	130 ft.
Width overall	140 ft.
Depth at sill, at mean high water	35 ft.
Depth over keel blocks at mean high water	32 ft. 6 in.

A track for a 40-ton crane will be built around the dry dock structure with the inner rail close to the edge of the coping. The total length of rail in this track will be within a few feet of one mile.

The construction of the dock will necessitate the disposal of 350,000 cubic yards of material. This will be utilized in filling some of the low areas on the station property. The depth of the excavation will be 58.5 ft. This is more than the height of an ordinary four story building. The total amount of concrete to be used in the dock is approximately 120,000 cubic yards.

Plans for this dry dock were prepared with unusual speed by the drafting room of the bureau of yards and docks. After certain preliminary studies and calculations had been made the entire set of contract plans was prepared in less than 20 days.

Bids were opened on Feb. 13 by the Bureau of Yards and Docks for the construction of the Pearl Harbor dry dock. As the bids, however, exceeded the appropriation, it may be necessary to advertise again. Following were the bids:

Edward Malley, 1384 McAllister St., San Francisco, Cal.; Item 1	$2,670,175.00
Cotton Bros. & Co., 241 Bacon Bldg., Oakland, Cal.; Item 1	2,950,000.00
MacArthur Bros. Co., 11 Pine St., New York, N. Y.; Item 1	3,468,000.00
San Francisco Bridge Co., 865 Monadnock Bldg., San Francisco, Cal.; Item 1	2,946,000.00
McDermott Contracting Co., 1116 Pennsylvania Bldg., Philadelphia, Pa.; Item 1	3,400,000.00
E. J. Lord Construction Co., Campbell Block, Honolulu, H. I.; Item 1	2,596,739.00
Pacific Construction Co., 16 California St., San Francisco, Cal.; Item 1	2,371,700.00
C. M. Leach, care Navy Yard, Boston, Mass.; Item 1	1,886,883.00

AID TO SHIPPING.

The two British steamers, Newton Hall and Foxton Hall, which left here yesterday after having taken on bunker coal, the former for New York and the latter for South American ports, are the first vessels of the recently organized American Steel Products Co., which will operate a line of steamers from New York to South America, stopping both ways for bunker coal at this port.

The new line will have two sailings per month from New York to Rio Janeiro, Buenos Ayres, Valparaiso and Lima, Peru, carrying consignments of steel rails, plates and similiar material manufactured by the United States steel Co.

Both the Foxton Hall and the Newton Hall were supplied with bunker coal by the Smokeless Fuel Co.

Editor MARINE REVIEW:—Your attention is called to the above clipping relative to the organization of a steam ship line between New York, Newport News and South American ports, which is interesting from the fact that this line will consist of foreign steam ships under charter.

The American public interested in shipping and kindred industries will readily recall the failure of a recent congress to pass the mail steam ship subsidy bill, which, would doubtless, have resulted in the establishment of several such lines of American ships to South American ports.

There could have been very little difference of opinion in regard to the many advantages of such legislation, particularly, as it was generally conceded that the revenue from this mail service would have been such as to have made the payment of these subsidies of little, if any, expense to the national government.

Although the majority of we American citizens have great confidence in the judgment and integrity of our representatives and senators in congress, unconsiously the question suggests itself to some of our minds—Could it be possible that the great power of a foreign lobby, or the weakness, or absence of a lobby favorable to this legislation, have had any influence in blocking such legislation in Washington?

Yours very truly,

A SUBSCRIBER.

Newport News, Va.

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COAL DOCKS AT UPPER LAKE PORTS.

Algonac, Mich.—
A. M. Smith, dock with steam hoist.
Alpena, Mich.—
Bedford & Co., steam hoist and bucket.
Alpena Coal Co., steam hoist and bucket.
Ashland, Wis.—
Clarkson Coal & Dock Co., has 22 ft. of water; three McMyler clamshell hoists, two of two tons each and one of one and one-half tons capacity, unloading 3,000 tons per 24 hours; storage capacity of dock, 75,000 tons; night and day shifts.
C. Reiss Coal Co., has 22 ft. of water; two Mead clamshells of one ton each, five Hunt buckets, three of which are of one ton capacity each; storage capacity of dock, 80,000 tons; night and day shifts. This dock is owned by the Chicago & Northwestern Railway and is operated under lease.
C. Reiss Coal Co., has 22 ft. of water; four one-ton bucket rigs, capable of unloading 1,000 tons in ten hours; storage capacity of dock, 50,000 tons. This dock is operated under a lease from the Wisconsin Central Railway.
C. Reiss Coal Co., 14 ft. of water; two buckets of one ton capacity each and one one-ton clamshell, capable of unloading 1,000 tons in ten hours; storage capacity of dock, 30,000 tons. This dock is operated under a lease from the Ohio Coal & Dock Co.
Northwestern Co-Operative Coal & Dock Co., has 19 ft. of water; whirley rig with one-ton bucket, also a one-ton clamshell; can unload 1,000 tons per 24 hours; storage capacity of dock, 10,000 tons.
Bay City, Mich.—
F. P. Young, 13 ft. of water.
Charles Mitchell.
Charles Clute.
Robert Bentel.
Hecla Portland Cement Co., private dock, 18 ft. of water.
Bruce Mines, Ont.—
Aberdeen Development Co., Ltd., hoist and buckets capable of unloading 400 to 500 tons per day.
Charlevoix, Mich.—
Charlevoix Coal & Wood Co., no equipment.
Chicago, Ill.—
Delaware, Lackawanna & Western R. R. Co., two docks—35th street dock, south fork of south branch of Chicago river at 35th and Iron streets, has two Mead hoists, capacity per hour, 250 tons, storage capacity for anthracite coal, under cover, 100,000 tons. Division street dock, north branch of Chicago River at Division street, has two Mead hoists, capacity per hour 250 tons, storage capacity for anthracite coal, under cover, 40,000 tons.
E. L. Hedstrom & Co., two docks—South Chicago dock, on the Calumet river at 95th street, three Mead hoists with crab or clamshell buckets, capacity 275 tons per hour. North avenue dock, on north branch of Chicago river, two Mead hoists, capacity 200 tons per hour.
O. S. Richardson Coal Co., two docks—one on the north branch of Chicago river, at 273 Elston avenue, just north of Division street on the main river, has two Mead movable towers, equipped with grab buckets; cable system for distribution to yard; capacity of plant 200 tons per hour. The other dock is on the south branch, at 2423 South Halsted street, has two Mead movable towers equipped with grab buckets; cable system for distribution to yard; capacity of plant 200 tons per hour.
Eureka Coal & Rock Co., 146 Clybourn Place, two Mead hoists equipped with one-ton grab buckets, capacity 125 tons per hour for each hoist.
George Lill Coal Co., 39 to 67 Chester street, corner Clybourn and Ashland avenues, two Mead-Morrison rigs, capable of handling 300 tons per hour of anthracite or 200 tons per hour of bituminous coal.
Lehigh Valley Coal Co., two docks—one known as the Calumet dock on Calumet river has 19 ft. of water; five McMyler hoists with a capacity of 180 tons each per hour; storage capacity for 100,000 tons. The other is known as the Clybourn avenue dock, located on the C., M. & St. P. Railroad, Chicago river. It has from 17 to 18½ ft. of water; four Brown hoists with a capacity of 150 tons each per hour; capacity of dock, 34,000 tons anthracite and 5,000 tons bituminous.
Philadelphia & Reading Coal & Iron Co., Meade hoists.
Collingwood, Ont.—
Collingwood Shipbuilding Co., unload by bucket and steam hoist; also horse power.
Corporation of Collingwood Wharf, unloads by bucket with horse power.
Collingwood Packing Co., unloads by electric power, working small hoists.
Depot Harbor, Ont.—

Appointments of Masters and Engineers of Lake Steamers.

PAUL H. HOEFT, ROGERS CITY, MICH.

VESSEL.	CAPTAIN.	ENGINEER.
Str. C. H. Starke	William Crosby	Herman Radtke
THE HOMEGARDNER SAND CO., SANDUSKY, O.		
Str. Mary H	John E. Hess	George Moore
HUTCHINSON & CO., MGRS., CLEVELAND, O.		
Str. J. J. Sullivan	William P. Benham	————
" D. R. Hanna	Sam B. Massey	————
" Joseph G. Butler Jr.	James Murphy	————
" John Stanton	Charles H. Heaton	————
" William A. Paine	Emil Detlefs	————
" Martin Mullen	U. S. Cody	————
" John A. McGean	Charles A. Benham	————
" J. T. Hutchinson	John A. Logan	————
" E. M. Peck	Herbert Dupuie	————
Sch. Abyssinia	T. K. Woodward	
THE IMPERIAL OIL CO., LTD., SARNIA, ONT.		
Str. Imperial	Norman Scott	William Tweedy
Bge. No. 41 Standard Oil Co. of N. Y.	Hans Lunde	
INDIANA TRANS. CO., CHICAGO, ILL.		
Str. Theodore Roosevelt	Donald MacLean	Edward Purvis
" United States	Edward Evans	Harry Irwin
INTERNATIONAL TRANSIT CO., SAULT STE. MARIE, ONT.		
Str. Algoma	H. A. Pocock	John Sutherland
" Fortune	H. A. Pocock	D. B. Smith
J. G. E. JACQUES & CO., MGRS., MONTREAL, CAN.		
Str. City of Ottawa	J. V. Trowell	William Kennedy
" City of Montreal	A. Lefebvre	Fred Hamelin
" Bickerdike	Oliver Patenaude	Eugene Hamelin
KELLEY ISLAND LIME & TRANSPORTATION CO., CLEVELAND, O.		
Str. Alvah S. Chisholm Jr.	D. Henderson	F. Mahaney
" E. P. Recor	Andrew Geisendorfer	Louis F. Miller
" Clinton	John Steible	Robert Burke
" W. B. Sanders	J. H. Wysoon	Frank Larsen
Bge. D. G. Cutler	A. Brant	
" Norman Kelley	J. D. Todd	
" James H. Pellett	William Kelley	
" David Moran	C. Smith	
CAPT. HARVEY J. KENDALL, MARYSVILLE, MICH.		
Str. H. J. Kendall	H. J. Kendall	George C. Morrison
C. M'G. KOCH, SANDUSKY, O.		
Str. Annie Laura	D. O. Lockhart	Jerry Shampaign
GILBERT LA CROIX, MT. CLEMENS, MICH.		
Str. A. D. Hayward	George C. Burns	George Stromble
CAPT. PETER LA CROIX, PORT HURON, MICH.		
Tow Bge. William Brake	Peter La Croix	
LAKE ERIE EXCURSION CO., BUFFALO, N. Y.		
Str. Americana	George S. Riley	William Steen
LAKE MICHIGAN CAR FERRY TRANS. CO., CHICAGO, ILL.		
Str. S. M. Fischer	M. J. Emerson	Fred Green
Bge. Wisc. & Mich., Ry. No. 1.	Alex Bohlen	
LAKE SHORE STONE CO., MILWAUKEE, WIS.		
Str. Topeka	Stephen Brownell	Chris. G. Olson
" Hennepin	George Coon	Charles Habermeier
WILLIAM LIVINGSTONE, MGR., DETROIT, MICH.		
Str. Livingstone	William Morehead	————
H. M. LOUD'S SONS CO., AU SABLE, MICH.		
Str. John B. Ketcham	N. L. Morrison	————
" Kongo	A. H. Shafer	————
MARINE TRANSPORTATION CO., OGDENSBURG, N. Y.		
Str. Nipigon	J. W. Goodrich	D. G. Costello
MARQUETTE & BESSEMER DOCK & NAV. CO., WALKERVILLE, ONT.		
Str. Marquette & Bessemer, No. 2	R. R. McLeod	E. Wood
" Marquette & Bessemer, No. 1	M. M. Rowan	Robert Leitch
MATHEWS STEAMSHIP CO., LTD., TORONTO, ONT.		
Str. Haddington	George J. Motley	R. J. Muchmore
" Edmonton	H. Maitland	James G. Fisher
" Beaverton	J. Delaney	H. R. Welch

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Str. Linden	William J. Cowles	Ed Mehner
" Britannic	E. H. Davis	F. Cadotte
" Pawnee	James Cassin	————
" Gogebic	A. C. Neal	————

MICHIGAN CENTRAL RAILROAD CO., DETROIT, MICH.

Str. Detroit	A. J. Huntoon	D. A. Black
	Fred Huntoon	Fred Robinson
" Transfer	George D. Horn	Ed Stimson
	John C. Craig	William Murderly
		George Black
		A. O. Barton
" Transport	William King	Henry Wilson
	Russell Aiken	Tom Hubbard
		John Cockburn
" Michigan Central	————	John Sullivan
		Alex Pirie
		John Gowen

MICHIGAN, INDIANA & ILLINOIS LINE, CHICAGO, ILL.

Str. John Oades	H. M. Boyce	Eugene Hidden
" Marion	H. J. Nelson	Fred Gartung
" Normandie	F. O. Johnson	————

MIDLAND NAVIGATION CO., MIDLAND, ONT.

Str. Midland Prince	George W. Pearson	Ed Abbey
" Midland King	James Tindall	George Smith
" Midland Queen	William Lavigan	A. Abbey
" Empress of Midland	Isaac Woolner	James McGregor
" Mount Stephen	William Cunningham	J. Pickard

MIDLAND TOWING & WRECKING CO., MIDLAND, ONT.

Tug Traverse	Roy Burke	John Murphy
" Reliance	J. W. Darling	John Kinnie
" Magnolia	Alex Cuff	George Wilson

J. B. MILLER, MGR., PARRY SOUND TRANSPORTATION CO., TORONTO, ONT.

Str. Seguin	James Wilson	R. G. Marshall

JAMES E. MYERS, CHICAGO, ILL.

Sch. Bertha Barnes	P. Lenane Myers	
Str. Otego	M. E. Myers	Thomas Isabell

MYLES TRANSP. CO., LTD., HAMILTON, ONT.

Str. Cataract	Leon Prijent	Peter Ryan
" Columbia	Charles Eber	James O'Neill

CHARLES S. NEFF, MILWAUKEE, WIS.

Str. Charles S. Neff	J. A. Doak	S. L. Newnham

S. O. NEFF TRANSPORTATION CO., MILWAUKEE, WIS.

Str. Omaha	Louis Holmes	R. Elhamer

NIAGARA NAVIGATION CO., LTD., TORONTO, ONT.

Str. Cayuga	John McGiffin	George M. Arnold
" Chippewa	C. J. Smith	H. Parker
" Corona	William Malcolm	A. J. Woodward
" Chicora	H. W. King	J. A. Findlay
" Ongiara	H. J. McIntyre	J. Byers

NIAGARA, ST. CATHARINES & TORONTO NAV. CO., ST. CATHARINES, ONT.

Str. Garden City	J. Haddock	J. Brown
" Lakeside	T. Runciman	H. MacMaugh

NIPIGON TRANSIT CO., GROSSE POINTE FARMS, MICH.

Str. J. C. Ford	James McLarty	Hubert Manion

NORTHERN NAVIGATION CO. OF ONTARIO, LTD., COLLINGWOOD, ONT.

Str. Hamonic	R. D. Foote	Sam Brisbin
" Huronic	A. L. Campbell	James Wilson
" Saronic	A. M. Wright	William Whipps
" Majestic	W. G. Cox	————
" Germanic	F. G. Moles	Joseph Asten
" City of Midland	M. A. Livingstone	Stephen Burgess
" City of Windsor	Not in Commission	
St. Bge. Doric	Samuel Hill	Samuel Beatty
" Ionic	M Ironsides	Hugh Myler
" Waubic	A. A. Bellrose	W. A. Black

NORTHERN STEAMSHIP CO., BUFFALO, N. Y.

Str. North West	G. A. Minar	M. N. McDonald
" North Land	J. J. Hartman	G. M. Tilton

JAMES O'CONNOR, TONAWANDA, N. Y.

Str. Lycoming	William J. Hayes	Adelbert Rhodes
Bge. Sweetheart	Frank Mooner	

OGDENSBURG COAL & TOWING CO., OGDENSBURG, N. Y.

Str. Nicaragua	James Owens	Freeman Axtell
" Avon	George P. Clifford	Charles Cotter
Bge. Twin Sisters	J. Mallett Sr.	
" Henry Witbeck	J. Mallet Jr.	
" Isaac Stephenson	————	
" Menominee	A. Demers	
" H. B.	————	

Grand Trunk Railway Co., steam hoists.

Duluth, Minn.—

Duluth, Missabe & Northern Railway Co., 19 to 22 ft. of water; three Meade-Morrison electric hoists with a capacity each of 200 tons per hour from boat to dock; total storage capacity, 630,000 tons.

Boston Coal Dock & Wharf Co., 19 to 22 ft. of water; six hoists with a capacity each of 50 tons per hour from boat to dock; total storage capacity, 350,000 tons.

Zenith Furnace Co., 22 ft. of water; four Mead-Morrison steam hoists with a capacity each of 125 tons per hour from boat to dock; total storage capacity, 225,000 tons.

Pittsburg Coal Co., Dock No. 1, 22 ft. of water; four hoists with a capacity each of 50 tons per hour from boat to dock; total storage capacity, 350,000 tons.

Northwestern Fuel Co., 19 to 22 ft. of water; six electric hoists with a capacity each of 200 tons per hour from boat to dock; total storage capacity, 650,000 tons.

Escanaba, Mich.—

Reiss Coal Co., four Mead hoists, capacity 600 tons each per day of ten hours; storage capacity, 100,000.

Chicago, Milwaukee & St. Paul Railway Co., three combination Mead and Brown hoists, capacity 600 tons each per day of ten hours; storage capacity, 80,000 tons.

Forestville, Mich.—

N. C. Potts, dock but no unloading equipment. There is no harbor at this port.

Fort William, Ont.

Canadian Pacific Railway Co., old and new docks. The new dock is equipped with five Mead-Morrison rigs and has a storage capacity of 200,000 tons of bituminous coal and 100,000 tons of anthracite. The old dock is equipped with two McMyler whirlies and has a storage capacity of 25,000 tons. The new dock is capable of unloading 520 tons per hour and the old dock can unload 60 tons per hour.

Canadian Northern Railway - See West Fort William, Ont.

James Murphy operates a domestic coal dock with a capacity for handling 400 tons per day.

Gladstone, Mich.—

Pittsburg Coal Co., seven Hunt hoists, three McMyler clamshells lifting one and one-half tons.

Green Bay, Wis.—

Cargill Coal Co., 20 ft. of water, three Mead hoists with a capacity of 350 tons per hour; storage capacity for 200,000 tons.

Chicago, Milwaukee & St. Paul Railroad, 20 ft. of water; three Brown hoists with a capacity of 200 tons per hour; storage capacity, 80,000 tons.

Duncan Fuel Co., 18 ft. of water; three steam hoists with a capacity of 100 tons per hour; storage capacity, 50,000 tons.

F. Hurlbut, 18 ft. of water; two steam hoists with a capacity of 60 tons per hour; storage capacity, 20,000 tons.

H. A. Barkhausen, 19 ft. of water; two electric hoists with a capacity of 60 tons per hour; storage capacity, 12,000 tons.

Flatley Bros. & Co., 18 ft. of water; two steam hoists with a capacity of 80 tons per hour; storage capacity, 8,000 tons.

Hancock, Mich.—

Portage Coal & Dock Co., two Mead towers with a capacity of 2,500 tons per day.

People's Fuel Co., one clamshell with capacity of 500 tons per day.

Holland, Mich.—

Austin Harrington, no unloading equipment.

Houghton, Mich.—

M. Van Orden Co., can work three hatches and unload 1,000 tons per day of ten hours.

Cooper Range, three Mead towers with a capacity of 3,000 to 3,500 tons per day.

Jack Fish Bay, Ont.—

Canadian Pacific Railway Co., one Mead tower of two tons capacity, one Mead tower of one ton capacity, two Hunt towers. Dredging not finished on Nov. 1, 1908.

Kenosha, Wis.—

George S. Baldwin Coal Co., steam hoist working two hatches at a time; capacity 70 tons per hour.

John O'Donnel Coal Co., steam hoist working two hatches at a time; capacity 70 tons per hour.

North Shore Coal Co., steam hoist working two hatches at a time; capacity, 70 tons per hour.

Kewaunee, Wis.—

W. Seyk Co., unloads by horse power.

Kewaunee Grain Co., unloads by horse power.

Keweenaw Bay, Mich.—

Mass Mining Co., three towers with separate hoists.

Kincardine, Ont.—

Corporations of Kincardine, unloads about 250 tons per day by horse power.

Bence Salt Co. unloads about 250 tons per day by horse power.

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VESSEL.	CAPTAIN.	ENGINEER.
" James Buckley	————	
" Hoboken	————	
" Fred Carney	————	
" Ireland	————	
Tug G. D. Seymour	P. J. McGrath	Thomas O'Neill
" Myra	William McKenna	John McKenna
ONTARIO & QUEBEC NAVIGATION CO., PICTON, ONT.		
Str. Alexandria	Joseph Rinfut	Thomas Milne
" Lloyd S. Porter	M. Heffernan	Lou Smith
" Aberdeen	William Dulmage	George Gerow
" Reliance	John Hudgins	Charles McWilliams
" Water Lily	Nelson Palmatier	J. F. Cote
St. Bge. Isabel Reid	————	————
" Rob Roy	H. Brooks	————
OTTAWA FORWARDING CO., OTTAWA, ONT.		
Str. Ottawan	George Depencier	Albert Shaver
" Hall	W. J. Hall	Edward Bedard
" Scotsman	A. G. Clark	H. Desjardin
" Welshman	Thomas Ranger	William Drury
" Hebron	F. P. Eligh	Noe Contois
OTTAWA RIVER NAVIGATION CO., MONTREAL, CAN.		
Str. Empress	Fred Elliott	James Lunan
" Duchess of York	E. P. Shepherd	Narcisse Marchand
" Victoria	J. C. Barclay	A. Toutant
" Princess	W. F. Halcro	Ferd Piche
F. E. PARKER, M. O., MERSHON, EDDY, PARKER CO., SAGINAW, MICH.		
Str. Langell Boys	Bert Payea	John Fettig
Bge. G. K. Jackson	E. M. Goodwin	
LOUISE A. PEDERSON, BUFFALO, N. Y.		
Sch. Buffalo	K. Pederson	
PENNSYLVANIA-ONTARIO TRANSP. CO., CLEVELAND, O.		
Str. Ashtabula	B. F. Haagenson	S. M. Sylvester
PORT HURON & SARNIA FERRY CO., PORT HURON, MICH.		
Str. O. D. Conger	William S. Meyer	William Waugh
" Hiawatha	E. M. Thomas	Thomas Horgan
" Grace Dormer	F. Duffy	John Kinirie
" James Beard	George Waugh	Oliver Durant
RED STAR LINE, BUFFALO, N. Y.		
Str. Robert Mills	C. F. Miller	Charles H. Wolvin
JAMES REYNOLDS, BROCKVILLE, ONT.		
Str. Bermuda	H. M. Russell	W. I. Brown
RIDEAU LAKES NAVIGATION CO., KINGSTON, ONT.		
Str. Rideau King	William Scott	George Shannon
" Rideau Queen	E. Fleming	Thomas Simmons
JOHN W. ROBINSON, M. O., ROBINSON BROS. LUMBER CO., NORTH TONAWANDA, N. Y.		
Str. C. H. Green	C. E. Little	William Ormsby
Sch. Genoa	D. C. Ryan	
" Our Son	M. T. Ryan	
ST. LAWRENCE & CHICAGO STEAM NAVIGATION CO., LTD., TORONTO, ONT.		
Str. E. B. Osler	William H. Wright	Edmund J. O'Dell
" W. D. Matthews	John Williams	Charles Robertson
" G. R. Crowe	Peter J. Shaw	Wallace Robertson
" Iroquois	Charles E. Robinson	William Harwood
" Algonquin	Fred R. Johnson	Robert Tait
LOUIS SANDS SALT & LUMBER CO., MANISTEE, MICH.		
Str. Wotan	Jacob Berentsen	Swan Peterson
" Maggie Marshall	Andrew Olson	Frank Winkle
Tug Hunter Savidge	Henry Danforth	William Sniderwind
SANDUSKY & ISLANDS STEAMBOAT CO., SANDUSKY, O.		
Str. Arrow	Harry Tyrie	William Quick
JOHN SCHROEDER LUMBER CO., MILWAUKEE, WIS.		
Str. Hilton	Rudolf Reiboldt	————
Tug Ashland	Manning Kilton	————
SOUTH SIDE LUMBER CO., CHICAGO, ILL.		
Str. Philetus Sawyer	Sam Anderson	Henry Baldwin
J. SOWARDS, KINGSTON, ONT.		
Str. Rand	M. Shaw	L. Whalen
STEWART TRANSPORTATION CO., DETROIT, MICH.		
Str. A. E. Stewart	Fred Stewart	Robert R. Lacey
THE THOMAS FURNACE CO., MILWAUKEE, WIS.		
Str. Byron Whitaker	James P. Stewart	D. W. Blauvelt
TOLEDO BUILDERS' SUPPLY CO., TOLEDO, O.		
Str. Walter D.	J. B. Warner	Charles Sullivan
" Laura D.	C. P. Sharbno	Dewitt Fields
" D. Dussault	John Moesing	Valentine Filker

Ludington, Mich.—
Cartier-Magmer Co., bucket hoist.
Anchor Salt Co., private dock, one steam hoist.

Manistee, Mich.—
James W. Duncan, 18 ft. of water, one steam hoist.

Manistique, Mich.—
Chicago Lumbering Co., steam hoist with three or four buckets.

Manitowoc, Wis.—
The C. Reiss Coal Co., two docks, four hoists with a capacity of 170 tons per hour and two hoists with a capacity for 200 tons per hour.
The J. G. Jackson Co., three hoists with a capacity for 100 tons per hour.
Manitowoc Land & Fuel Co., three hoists with a capacity of 150 tons per hour.
Goodrich Transit Co., private dock, two hoists with a capacity of 70 tons per hour.

Marine City, Mich.—
R. A. Cottrell, derrick, steam hoist and chutes.
Blood & Hart, derrick, steam hoist and chutes.
M. Sicken, derrick and horse power.
J. C. Miller, unloads by horse power.

Marquette, Mich.—
The James Picand Co., two Mead hoists on elevated trestle, track on dock for cars, capacity 200 tons per hour.
F. B. Spear & Sons, one McMyler hoist, capacity 100 tons per hour.

Menominee, Mich.—
Lyon Bros., steam hoist.
F. C. Nunach, steam hoist.
Ramsay & Jones, steam hoist.
Menominee Sugar Co., steam hoist.

Michigan City, Ind.—
W. L. Rawlings & Co., unloads in wheelbarrows.

Michipicoten, Ont.—
Algoma Central & Hudson Bay Railway Co., five-ton hoist with buckets, also winches.

Milwaukee, Wis.—
Lehigh Valley Coal Co., Canal street dock, has two Mead-Morrison single hoist machines with unloading capacity of 300 tons per hour; depth of water 21 ft.; storage capacity, 75,000 tons.
North Western Fuel Co., Dock No. 1, Canal street, west side; four unloading towers and eight unloading booms. Dock No. 2, Washington street, south side; 17 unloading masts.
Central Coal Co., Brown hoists.
Philadelphia & Reading Coal & Iron Co., Brown hoists.
Standard Gas Dock, Brown hoists.

Munising, Mich.—
Munising Railway Co., unloads by hand.

Muskegon, Mich.—
Magoon & Kimball Co., 18 to 24 ft. of water; steam hoist.
Bauchnecht Bros., 18 to 20 ft. of water; no hoist.

Owen Sound, Ont.—
Smith, Davis & Co., 16 to 22 ft. of water; unload with horse and bucket.
T. K. McLauchlan, 16 to 22 ft. of water; unloads with horse and bucket.
Soole Bros., unload with horse and bucket.
A. J. Creighton, unloads with horse and bucket.
Canadian Pacific Railroad, unloads by clamshell and steam hoist.
Gray & Bruce Portland Cement Co., of Shallow Lake, Ltd., 16 to 22 ft. of water; unloads with clamshells and steam hoist.
Owen Sound Portland Cement Co., 16 to 22 ft. of water; unloads with clamshells and steam hoist.

Parry Sound, Ont.—
William Beatty Co., storage capacity for 1,000 tons anthracite.
Galna & Danter, storage capacity for 1,000 tons anthracite.

Port Arthur, Ont.—
Canadian Northern Coal & Ore Dock Co., has 600 ft. dock frontage, equipped with three Mead-Morrison unloading rigs capable of unloading 500 tons per hour. The dock has storage capacity for 300,000 tons of bituminous coal and 25,000 tons of anthracite.

Port Huron, Mich.—
McCollom Coal Co., one steam hoist.
Miller Coal Co., McMyler hoist.
Port Huron & Duluth Steamship Co., McMyler hoist.
Thompson Coal Co., derrick and horse power.
Jarvis Coal Co., derrick and horse power.

Port Washington, Wis.—
Port Washington Fuel Co., unloads by steam.

Port Sanilac, Mich.—
M. N. Mugan & Son, unloads by hand into buckets hoisted by a derrick.

Racine, Wis.—
Racine Gas Light Co., 17 ft. of water;

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VANCE & JOYS, MILWAUKEE, WIS.

VESSEL.	CAPTAIN.	ENGINEER.
Str. Maryland	T. Kelley	M. Conley
" Manchester	E. Zwemer	James Grant
" F. Schlesinger	E. H. Brownell	Harry Stekke
" F. L. Vance	————	————
" R. P. Flower	————	————

L. C. WALDO, MGR., DETROIT, MICH.

Str.	L. C. Waldo	John Duddleson	N. E. Allen
"	Harvey H. Brown	D. Girardin	Nicklas Anderson
"	Fayette Brown	D. Girardin Jr.	Joseph Bouffard
"	S. R. Kirby	W. L. Girardin	Martin Layman
Bge.	George E. Hartnell	Joseph Sanders	

WESTERN STEAMSHIP CO., LTD., TORONTO, ONT.

Str.	J. A. McKee	W. J. Bassett	Angus M. McInnes
"	Wexford	George H. Playter	John G. McHattie

CHARLES WESTON, M. O., TONAWANDA BARGE LINE, NO. TONAWANDA, N. Y.

Str.	F. R. Buell	C. W. Woodgrift	Tom McLaughlin
Bge.	A. Stewart	Fred Chamberlain	
"	Eleanor	Fred Chamberlain	

JAMES A. WHITE, BUFFALO, N. Y.

Str.	Three Brothers	Sam Christopher	————

WHITE, FROST & WHITE, NORTH TONAWANDA, N. Y.

Str.	Edward Smith	C. D. Miller	C. C. Smith

CAPT. W. J. WILLOUGHBY, MGR., W. & B. TRANSIT CO., WINDSOR, ONT.

Str.	Iron Age	W. J. Willoughby	Richard Baxter

WYANDOTTE TRANSPORTATION CO., DETROIT., MICH.

Str.	Alpena (Building)	D. R. Parsons	R. W. Hunter
"	Wyandotte	William H. Yates	J. W. Drysdale

three Mead bucket hoists; 800 tons per day with 18 shovelers; Mead automatic railway. Handle three-fourths Youghiogeny only, for gas purposes.

W. H. Pugh, lower dock 13 ft. of water; two Mead clamshell hoists; automatic railway, capacity 1,000 tons per day. Upper dock, 15 ft. of water, two steam rigs, unload 600 tons per day.

Estate of Joseph C. Carroll, 15 ft. of water, two steam hoists, unload 750 tons per day.

Racine Fuel Co., 16 ft. of water, unload 700 tons per day with two steam hoists.

Baumann & Murphy, 17 ft. of water, three steam hoists, unload 1,000 tons per day.

Saginaw, Mich.—

Saginaw Ice & Coal Co., 14 to 16 ft. of water, 400 ft. river frontage; steam hoists operating buckets capable of unloading 350 to 400 tons per hour.

Saginaw Coal Co., 16 ft. of water; 100 ft. river frontage; steam hoist with a capacity of 40 to 50 tons per hour; storage capacity, 15,000 tons.

Remer Bros., 10 ft. of water; 500 ft. river frontage; bucket steam hoist with capacity of 35 to 40 tons per hour; storage capacity, 7,000 tons.

Consolidated Coal Co., 700 ft. of river frontage; steam bucket hoist with capacity of 1,000 tons per hour; storage capacity, 20,000 tons.

St. Clair, Mich.—

Diamond Crystal Salt Co., two steam clamshells.

Estate of John Schlinkert Sr., unloads by horses and wheelbarrows.

William R. Kemp, unloads by horses and wheelbarrows.

Baby & Dale, unload by horses and wheelbarrows.

St. Clair Milling Co., unload by horses and wheelbarrows.

Thompson Bros Salt Co., unload by horses and wheelbarrows.

St. Joseph, Mich.—

John Wallace & Sons, no unloaders.

William M. Brown & Bros., no unloaders.

F. W. Ormsby, no unloaders.

Sarnia, Ont.—

John Garroch, unloads by means of a revolving crane operated from a scow.

Clark Coal Co., unloads by horse power.

Imperial Oil Co., private dock, unloads by revolving crane and clamshell buckets.

Reid Wrecking Co., two hoisting machines, rotary derricks worked from scows and operating clamshell buckets.

Northern Navigation Co., private dock, McMyler plant, consisting of revolving crane with buckets, operating from a scow.

Sault Ste. Marie, Mich.—

Port Royal, or Pittsburgh Coal Dock, 22 ft. of water; four McMyler hoists; storage capacity, 20,000 to 25,000 tons.

George Kemp Coal Co., lower dock, 20 to 21 ft. of water; three McMyler hoists; storage capacity, 10,000 tons.

George Kemp Coal Co., upper dock, above the Canal, 14 to 15 ft. of water; one McMyler hoist; storage capacity, 4,000 tons.

Frank Perry Coal Co., 20 ft. of water; one McMyler hoist; storage capacity, 6,000 tons.

Sault Ste. Marie, Ont.—

New Ontario Dock & Coal Co., slip 260 ft. long; 19 ft. of water; unload by latest improved Fairbanks-Morse tower with a capacity of 1,000 tons per day of ten hours; also have one McMyler hoist; storage capacity, 8,000 tons.

Algoma Central & Hudson Bay Railway Co.; one McMyler ten-ton, one Industrial ten-ton and one five-ton hoist, with clamshell, orange peel and dumping buckets.

Coal, Iron & Metal Dock, 15 to 16 ft. of water; one McMyler hoist; coal is run ashore on trestle from dock, for storage in yard, capacity, 3,000 tons.

Algoma Central Coal Co., 22 ft. of water; unload 5,000 tons per day; stock pile capacity, 400,000 tons.

Dominion Government Dock, 15 ft. of water; hoists operated by horse power.

Sawyer, Wis.—

Lyon Bros. & Co., small buckets operated by horse power.

Sheboygan, Wis.—

C. Reiss Coal Co., depth of water sufficient for vessels drawing 20 ft.; 17 unloading rigs with capacity of 7,500 tons per day.

Sheboygan Coal Co.

Sturgeon Bay, Wis.—

Leatham & Smith Towing & Wrecking Co., steam hoist with steel buckets having a capacity of one ton each.

Hart Transportation Co., small bucket operated by horse power.

Superior, Wis.—

Pittsburgh Coal Co., of Wisconsin, four docks. No. 3, St. Louis Bay, four McMyler hoists; storage capacity 175,000 tons. No. 4, Superior Bay, three Kaestner hoists; storage capacity, 125,000 tons. No. 5, Allouez Bay, 40 boom hoists, four bridge hoists; storage capacity, 300,000 tons. No. 6, St. Louis Bay, three Brown hoists; storage capacity, 125,000 tons.

North Western Fuel Co., Dock No. 1, foot Hill avenue; east side four Brown unloading towers; west side, two Heyl & Patterson unloading towers. Dock No. 2, foot Winter street; five Mead towers and six Hunt towers. Dock No. 3, foot of Banks avenue, 17 unloading masts.

St. Paul & Western Coal Co., seven Hunt rigs, capacity of 3,000 tons of bituminous or 4,000 tons anthracite per day. Storage capacity, 200,000 tons.

Philadelphia & Reading Coal & Iron Co., present dock has 20 to 21 ft. of water; three Brown hoists and three Mead-Morrison hoists with a combined unloading capacity of 4,500 tons in ten hours; storage capacity, 225,000 tons. This company is also building a new dock at Superior with a storage capacity of 450,000 tons, to be equipped with the most modern unloading machinery.

Northern Coal & Dock Co., dock on Superior Bay; has 21 ft. of water; three Mead hoists, capable of unloading 6,000 tons in ten hours; storage capacity, 250,000; handling capacity, 500,000. Can be reached either from Duluth entry or Superior entry.

Lehigh Valley Coal Co., dock has 20 ft. of water; McMyler hoists for unloading hard coal and Bogle hoists for unloading soft coal with a combined capacity of 5,500 tons in ten hours. Dock has storage capacity for 150,000 tons of anthracite and 50,000 tons bituminous. Dock has a frontage of 900 ft.

Berwind-White Coal Co., three electric rigs made by Dodge Coal Storage Co. Storage capacity, 300,000 tons.

Thessalon, Ont.—

Algoma Customs Smelting Co., 18 ft. of water, one steam unloader.

Two Harbors, Minn.—

Duluth & Iron Range Railroad Co., three Mead towers, on a trestle 64 ft. above water; each tower operated by a 130 H. P. steam engine; 48 cars equipped with automatic swivel grip are operated by 50 H. P. motor; length of cable 4,236 ft.; 80 pockets, capacity 3,900 tons; capacity of dock exclusive of pockets, 112,000 tons; bridge is 275 ft. long and 34 ft. from floor of dock to bottom of bridge and is operated by 150 H. P. motor; bridge travels 560 ft. at the rate of 30 ft. per minute; pickup bucket on bridge averages 100 tons per hour.

Two Rivers, Wis.—

Two Rivers Coal Co., two traveling bridges equipped with one-ton clamshells; capacity 100 tons per hour; 420 ft. long.

John Gesell, unloads by means of horses 30 tons per hour; dock 330 ft. long.

Washburn, Wis.—

Northwestern Fuel Co., 16 hoists equipped with modern clamshell buckets; capable of handling 250,000 to 300,000 tons per season; storage capacity, 150,000 tons; 20 ft. of water; dock 550 ft. long.

West Fort William, Ont.—

Canadian Northern Railway Co. Dock equipped with McMyler whirlies capable of unloading 1,000 tons per day; storage capacity, 25,000 tons.

Wiarton, Ont.—

Dominion Fish Co., unload by hand.

Colonial Cement Co., steam hoist.

Peninsula Tug & Towing Co., unload by hand.

BRITISH NAVAL BUILDING ACHIEVEMENT.

A graceful compliment was paid the great British ship building firm of Vickers, Son & Maxim, at Barrow-in-Furness, by Mr. Reginal McKenna, M. P., Forest Lord of the Admiralty, in connection with the launch of the largest British warship on Feb. 22. The firm have built this ship which had a launching weight of 10,250 tons, or 1,000 tons more than any battleship previously launched. The ship was of the Vanguard type, but its predecessors were mostly 7,000-ton vessels. When launched the Vanguard was already furnished with 80 per cent of the immense armor walls of the turret. The launching ceremony was performed by Mrs. McKenna, the wife of the First Lord, on the occasion of a great public holiday, and the vessel was christened in the customary manner by the breaking of a bottle of champagne on the bow of vessel. Mr. McKenna, speaking on behalf of his wife, proposed the toast of "Success to the Great Firm of Vickers, Son & Maxim." The speaker continued that while their great dealings with Messrs. Vickers and one other great firm were those of buyers and sellers their relations were far more cordial than the ordinary relations of commerce. The

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Admiralty recognized to the full, the great public service rendered by a firm which was able to lay down, to build, complete, and supply with all the necessary machinery and material, a ship like the Vanguard, which, perhaps, for all they could tell, at a possible moment of national peril might be the means of securing the safety of our country. (Loud cheers.) The admiralty bought from Messrs. Vickers, but felt that when they received armaments from them they were receiving a national service, and were giving of the best that England had to give by way of material for our national fleet. (Cheers.) He was glad to have the opportunity of saying how much the admiralty prized the good feeling that existed between them and the great firms who supplied them. They could not get on unless they had that good feeling; unless they could rely upon those firms and knew that in any emergency they would be ready to put everything within their resources at the disposal of the admiralty, they could never answer to parliament and the country for the necessary supplies in order to maintain the supremacy of the fleet. (Cheers.) He regarded the existence of a firm like Messrs. Vickers as a national asset, and could only say that had Messrs. Vickers not been invented the first duty of the nation would be to discover them. (Laughter and cheers.)

Mr. Albert Vickers, responding, expressed the hope that many equally good ships might follow from the berth in which the Vanguard had been built, and they sought to make the works capable of meeting every demand the government might make upon them either in respect of ships, machinery or ordnance. Mr. McKenna would recognize, too, their heavy responsibilities in regard to the large body of men who had been trained to that high class of work, and to the families dependent upon them. He would say that the interest of the nation might be served, as well as those of the firm's workmen, by many ships being built to follow the Vanguard from those works. (Cheers.)

The Andresen-Evans Co., 1501 Monadnock block, Chicago, announce that David J. Evans has resigned as manager of sales of the Rail Joint Co., and will hereafter give his personal attention to the duties as president of the Andresen-Evans Co. H. P. Andresen will continue as vice president and chief engineer. The company designs iron and coal unloading buckets ad conveying bridges.

ATLANTIC COAST NOTES.

Office of the MARINE REVIEW,
Room 1005, No. 90 West St.,
New York City.

John H. Starin, for many years prominent in steamboat transportation circles, died at his home in New York city on March 22. Mr. Starin was head of the Starin line, with vessels plying between New York and various New England ports, and owned a shipyard and dry dock on Staten Island. He was born in 1825 at Sammonsville, N. Y., served in Congress from 1877 to 1881, and was vice president of the old New York City Rapid Transit Commission.

The time of sailing from New York of the steamers of the Fall River line has this week been changed from 5 p. m. to 5:30 p. m.

The Clyde line this week changes the sailings of the Philadelphia, Norfolk, Portsmouth, Newport News service from Tuesdays, Wednesdays, Fridays and Saturdays, to Mondays, Wednesdays, Thursdays and Saturdays. The passenger service is eliminated on this line.

The treasury department reports that the revenue cutter Seminole has removed a menace to navigation consisting of a part of the wrecked schooner William L. Walker, about 37 miles south, 63 degrees 30 minutes west from Cape Lookout shoals lightship.

The schooner Cleopatra, after drifting about the Gulf of Mexico since Jan. 28, a hopeless derelict, has drifted ashore near St. George's island, Fla. The bodies of the crew were washed ashore after the vessel was wrecked. The Cleopatra is owned in the vicinity.

The Red Star liner Finland, which is now in the White Star line Mediterranean service, arrived last week from Naples, taking the place of the Republic. She will run on the Republic's schedule for the next six months. Extensive alterations were necessary on the Finland in order that the liner could comply with the Italian emigration laws.

The United States supervisors, of the steamboat inspection service, who have been making an inquiry, have exonerated the crew of the John H. Starin in the matter of the grounding of the steamer at the Bridgewater breakwater on Feb. 19.

The Holland-America Steamship Co. has acquired and will take over at once the Furness-Withey & Co. steamship service between Rotterdam and Baltimore. Six steamers are to be put on the new route by the Holland-American line.

The Jacksonville Tropical Steamship Co. was organized at Jacksonville, Fla., last week, to operate between that port, the Isle of Pines, Cuba and Central American ports. The company has purchased the steamship Goldsboro, which about a year ago sailed out of New York with a general cargo for parts unknown, piloted by the Bailey Brothers.

No appropriation has been made for lighting the Delaware river between Bordentown and Trenton, despite the efforts of the lighthouse officials. Two lights were recently erected, one at Biles' and the other at Duck's island, but as no appropriation has been made for their maintenance they are not looked upon as permanent.

The British steamship Irish Monarch, now on her way to Philadelphia, has been chartered to load a cargo of case oil at Point Breeze for the Philippine Islands. She is to receive 14½ cents per case freight.

An unusual quantity of ice is reported in the track of trans-Atlantic liners, incoming craft still reporting passing through large ice floes in the vicinity of Cape Race. Several large bergs have also been reported. The steamship Evangeline, which arrived at Halifax on Saturday, from Liverpool, was forced to run 40 miles south of her course in order that she might get clear of the bergs.

The first shipments of ice this season have arrived at Philadelphia on the Reading barges Marion and Cleona, from Boothbay, Me., in tow of the tug Lykens. Each vessel had on board 2,000 tons, which will be discharged for storage.

The schooner Rebecca J. Moulton, in a distressed and wrecked condition arrived in Savannah on Monday. The Moulton was 44 days out from Newport News, and had been driven out of her course to the Bermudas. Provisions had been obtained by the crew from a foreign vessel bound for Glasgow.

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THE MARINE REVIEW

DEVOTED TO EVERYTHING AND EVERY INTEREST CONNECTED OR ASSOCIATED WITH MARINE MATTERS ON THE FACE OF THE EARTH.

Published every Thursday by

The Penton Publishing Co.
CLEVELAND.

BOSTON.....73-74 Journal Bldg.
BUFFALO.....932 Ellicott Sq.
CHICAGO.....1328 Monadnock Blk.
CINCINNATI.....First National Bank Bldg.
NEW YORK.....1005 West Street Bldg.
PITTSBURG.....510 Park Bldg.
SEATTLE.....302 Pioneer Bldg.

Correspondence on Marine Engineering, Ship Building and Shipping Subjects Solicited.

Subscription, U. S. and Mexico, $3.00 per annum. Canada, $4.00. Foreign, $4.50. Subscribers can have addresses changed at will.

Change of advertising copy must reach this office on Thursday preceding date of publication.

The Cleveland News Co. will supply the trade with the MARINE REVIEW through the regular channels of the American News Co.

European Agents, The International News Company, Breams Building, Chancery Lane, London, E. C., England.

Entered at the Post Office at Cleveland, Ohio, as Second Class Matter.

March 25, 1909.

THE PANAMA CANAL.

Lieut. Col. George W. Goethals, chairman and chief engineer of the Isthmian Canal commission, has prepared an exhaustive paper on the canal problem. He reviews the efforts of the French company to construct a canal and reviews the various plans that have been proposed from time to time by noted engineers. He is an advocate of the lock type of canal as against the sea level type. In discussing the merits of the two plans he says:

"So far as the two prisms are concerned, for ease and safety of navigation the lock type is better because of the greater widths of channels, fewer and easier curves, and freedom from objectionable and troublesome currents, both from the Chagres and its tributaries. This must be admitted by all, but the exponents of the sea-level type concentrate their attention on the obstructions and dangers that the locks constitute in the lock type, and also on the dangers that will result from the failure of the Gatun dam, forgetting that at least equally great disaster must follow the failure of the Gamboa dam. The lock in the sea-level canal is not mentioned, probably because the danger is not so great, since there is but one.

"Experience shows that the risks to ships in narrow waterways are material and important. In such a channel as the original Suez canal the delays and losses to commerce were great, and the danger to ships considerable; although the benefit of the widening is striking, this is true even now.

"It is well known that the narrow channels connecting the great lakes have been obstructed repeatedly by vessels aground or wrecked in such a manner as to block traffic. Even in the entrances to our seaports there is a frequency of accidents, which illustrate the difficulties encountered in navigating narrow and tortuous channels.

"Accidents in locks have been relatively few, and none of a serious nature have occurred at the St. Marys Falls canal during 54 years of its use. The risks to ships in such a narrow waterway, as proposed for the sea-level canal at Panama, far outweigh all hazards in the proposed lock canal, *provided* the latter is built so as to minimize the chance of accident at the locks. This is met by providing every possible safety device, by building the locks in duplicate and by the installation of a system by which the vessels will be controlled by powerful electric machinery on the lock walls, thus avoiding mistakes on the part of the vessel's crew or engine room staff, which once led to an accident at the Manchester ship canal."

The present lock designs provide intermediate gates dividing the locks into lengths of 600 ft. and 400 ft. About 98 per cent of all the ships, including the largest battleships now building, can be passed through the 600 ft. lengths, and the total lock length will accommodate the largest commercial vessels now building which are approximately 1,000 ft. long and 88 ft. beam. It should be added that the commerce of the world is carried today by medium sized vessels. Only one of the many vessels using the Suez canal is over 600 ft. long. Concerning the general opposition to the lock type he says:

"Increasing the width of Culebra cut, as recently ordered, from 200 to 300 ft. is advanced as an argument to show that the locks are too narrow. Ships do not navigate the locks in the sense that they do in the canal prism, and the wider the channel the easier will be navigation. On account of slides that developed in Culebra cut considerably more additional work was made necessary in the upper reaches of the divide than was contemplated, and the advantages of the increased width to navigation were so great, compared with the relative amount of material to be removed in order to secure it, that the President ordered it. By this action the width of the locks is in nowise called into question.

"The water supply for lockages was so exhaustively treated by the minority of the board that it has not been called into question by anyone who has carefully considered the report and data submitted therewith. Recently, however, the theory has been advanced that the water of the lake may seep through the adjacent hills or through the bottom, and is significantly referred to as a mooted question. This possibility is emphasized by the seamy quality of the rock when exposed. The French plans, with Bohio Lake, were the result of careful and protracted study and investigation, and nothing of the kind was anticipated. The commission of 1901 was not in doubt of the resisting power of the hill covering such a flow. The report of the geologist on the general formation of the country does not lead to any such dread or fear. The reservoirs, constructed in the hills of the same geological formation as the entire lake area, are not affected by any such leakage or seepage. At Black Swamp, an extensive area between Bohio and Gatun, the water stands above the level of the Chagres, which is within half a mile, and also above sea level the level of the water remains unchanged, clearly indicating no such leakage.

"Toward the close of the last dry season certain measurements of the Chagres at Bohio indicated a less dis-

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charge there than at Gamboa; this was subsequently exploded by other observations which showed that the first ones were in error. Notwithstanding this, and in spite of the many evidences of the tightness of the earth covering, the possibility of a flow through the hills was advanced and was seized upon as another argument against the lock type."

The board of consulting engineers estimated the cost of the lock type of canal at $139,705,200 and of the sea-level canal at $247,021,000. These sums were for construction purposes only and eliminated sanitation, civil government and the purchase price. Colonel Goethals ventured to say, however, that the lock type of canal would cost $300,000,000 and the sea-level type $477,601,000 for construction only or $563,000,000 with sanitation and civil government costs added. Regard earthquakes, Col. Goethals says that none has occurred of any importance since the seventeenth century and that at any rate both lock and sea-level types would suffer equally; nor does he regard a lock canal more vulnerable than a sea-level canal in time of war. Both are subject to attack by land or air.

In concluding Col. Goethals says:

"I have endeavored to show that a channel of sufficient width, in which the waters of the many streams, especially the Chagres, will not be a menace, is one most desired for an Isthmian canal. The sea-level canal proposed by the majority of the board of consulting engineers is not of sufficient width, nor is the proposed solution for the impounding and diversion of the Chagres and other streams based upon sufficient investigations to insure its success. The "ideal" sea-level canal, the Straits of Panama, recently proposed, is not based upon any investigations of the work to be done and can not, in view of the approximate estimate of the cost of our own sea-level canal, which is about one-third the size of the "ideal" plan, be given serious consideration. Every criticism against the stability of our locks or dams can be attributed to either an argument in favor of one's own plans or to absolute ignorance of the exhaustive data concerning their safety now in existence. The several other plans of lock-type canal have nothing in their favor that the plan now adopted does not possess to a greater degree.

"I have endeavored also to show that the organization on the Isthmus is compact and complete in every way, performing its duties of construction, sanitation, and government with clock-like precision. I can not do better than quote from the message recently sent to the congress, 'that hereafter attack on this type—the lock type—is in reality merely attack upon the policy of building any canal at all', for the adoption of a sea-level canal anywhere approaching the ease of navigation of the lock type will result in the ultimate abandonment of the canal; and I assure you that several years hence, no later than Jan. 1, 1915, even the most ardent sea level advocates will, in making the voyage through the canal, admit that the ability to navigate a battleship at a high rate of speed through the lake and wide channel from Gatun to Pedro Miguel far outweighs the small inconveniences of the safe lockages up to and down from the summit level."

OIL-FUEL RESULTS.

Except in the case of steamers built for carrying oil in bulk, or those trading to or from, or in the region of, the oil-fields, it can scarcely be said that liquid fuel has made much headway in the merchant service. It is true that the evaporative efficiency, weight for weight, is from 33 to 70 per cent better than coal, according to the calorific value of the latter, and that the reduction in bunker capacity and in weight of fuel carried enables more cargo to be taken, or a smaller ship to be built for a given duty, or a higher speed to be realized for the load carried. In the case of the high-speed Cunarders, for instance, there might have been a possible reduction of between 2,000 and 3,000 tons in displacement, and this would have increased greatly the speed for the same power, or reduced the power for the same speed. But with oil in this country selling at 60s, as compared with anything from 10s to 20s per ton for coal, there is not much inducement to adopt the liquid-fuel system. Indeed, the great cost is carrying weight with economists, even at the admiralty, notwithstanding the great strategical and tactical advantages of oil fuel already well known.

There are other gains, however, in the reduction of the cost of burning the fuel—in the loading, trimming, and stoking of fuel, in the smaller staff required, and in the repairs, etc., bill. It has been difficult to get exact comparative data of the financial results of burning oil and coal, apart from the calorific results. In the accompanying table there are given such comparative figures from three merchant ships in service:—

There is given a comparison of the expenses in three different ships, the third a moderate-sized cargo carrier. Column 4 gives the consumption respectively in each ship for the same service, and it will be seen that the oil is about 33 per cent less than the coal; in other words 2 tons of oil give the same energy at the propeller as 3 tons of coal. The number of firemen (column 5) and the wages paid (column 6) in the smaller steamers when using oil fuel is less than one-fourth what they are when using coal; but with increased size of ship and greater power of machinery the gain is augmented. Thus the owner of the cargo steamer using oil pays in wages only one-fifth of the sum disbursed when burning coal. Oil does not need to be trimmed nor conveyed by men from distant bunkers. For very small cost in steam pumping power it is automatically fed into the boiler, which is not the case with coal. The relative repair and maintenance costs given in column 8 are most significant; liquid fuel is a preservative of steel; as the boiler doors are never opened, as with coal-burning, there are no sudden variations in temperature as those which affect junctions of tubes with tube-plates, and involve other troubles with coal-fired boilers. The net result is that oil in a steamer using 200 tons per day costs 4d per ton to burn, against 2s 6d for coal. This does not include the first cost of the fuel or plant for separating water from the oil, compressing, and air-spraying the oil.—*Engineering*, London.

COMPARISON OF THE LABOR COST PER DAY OF BURNING COAL AND OIL IN THREE STEAMERS.

1. Example.	2. Fuel.	3. Boiler Draft	4. Tons of Fuel Used.	5. Number of Firemen.	6. Wages of Stokehold Complement.	7. Victuals-Firemen, &c.	8. Repairs and Maintenance.	9. Total Cost.	10. Total Cost per Ton of Fuel.
					£ s. d.	£ s. d.	£ s. d.	£ s. d.	s. d.
1	Coal	Natural	22½	11	1 9 4	0 11 0	0 5 5	2 5 9	2 0
	Oil	Do.	15	3	8 0	0 3 0	0 0 9	0 11 9	0 9½
2	Coal	Forced	29½	14	1 17 4	0 14 0	0 10 1	3 1 5	2 1
	Oil	Do.	19½	3	8 0	0 3 0	0 1 0	0 12 0	0 7½
3	Coal	Forced	300		19 12 0	12 13 0	5 5 0	37 10 0	2 6
	Oil	Do.	200	12	2 0 0	0 18 0	0 7 6	5 5 6	0 4

Samuel B. Macdonnell, statistican of the Board of Commissioners and Navigation, Philadelphia, reports arrivals of 342 at Philadelphia during February as against 305 for 1908. This includes both foreign and coastwise.

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EARLY ORE SHIPMENTS.

The following reprint from the *Cleveland Leader,* of March 2, 1884, now in the possession of Capt. W. C. Richardson, is quite interesting:

At this season of the year when iron ore and coal carrying rates on the lakes are under discussion, it is certainly an appropriate time to review the history of these contracts and engagements for some years past. A gentleman in marine circles, who has been long connected with the traffic and who knows a great deal of the history of the iron ore trade, has gathered the larger part of what appears below on the subject. The information secured from him will be found of interest not only to men in marine circles, but to the shipper and the iron ore and coal trade generally, giving as it does the carrying rates on the products of the mines from 1854.

The First Ore Brought to Cleveland was in the year 1852 and was contained in six barrels aggregating probably a couple of tons.* It was shipped by the Marquette Iron Co. on a vessel called the Baltimore and was brought down as an experiment. It proved satisfactory and the first regular cargo for commercial purposes was brought down about two years later or in 1854, and consisted of about 1,400 or 1,500 tons. The carrying rate is not known but it is believed to have been a good round sum. Beginning with this first shipment in 1854 the following figures for the next few years will show the rate of increase. In 1856 there was brought down 11,597 tons; in 1857, 26,184 tons; in 1858, 31,035; in 1859, 65,679 tons; in 1860, 116,998 tons; in 1861, 45,430 tons; in 1862, 115,721 tons; in 1863, 185,257 tons; in 1864, 235,123 tons; in 1865, 195,256 tons; in 1866, 296,872 tons; and in 1867, 469,320 tons. From these figures can be seen the state of increase in shipments each year, but coming on down to the year 1872, after a period of 18 years in which the iron ore business had slowly grown in volume, until the total number of tons brought down that year was 948,553. The entire product from 1854 to 1872 was 4,721,354 tons.

The Winter Charters of 1872 were at the rate of $2 per ton from Escanaba to Cleveland, and $2.20 per ton from the same port to Erie. More difference was then made for carrying ore to Erie than is now the custom. At the same time the rate on ore from Marquette to Cleveland was $2.80 and $2.85, and to Erie $3.05. The sales held steady all along the earlier part of the year but by July had so increased that $2.50 per ton was the rate from Escanaba to Cleveland, and $3.50 per ton the rate from Marquette. From that month on there was an increase in the rate until the close of the season, in October, when the going rate was $5.25 from Escanaba to Cleveland, $5.50 to Erie, and $6 to $6.50 from Marquette to Cleveland, and $7 to $7.50 to Erie.

The winter charters for the following year, 1873, were made at $2.50 per ton from Escanaba to Cleveland, and $3.50 per ton from Marquette, with about the same difference of 20 to 25 cents per ton to Erie which had characterized the year before. Further statement of this difference will be omitted in the remainder of this article, as it gradually faded out, and within the last few years has not always amounted even to 5 cents per ton. The opening rates of 1873 were maintained during that year with some slight fluctuations, and closed the season at exactly the opening figures from Escanaba, and with $3.40 as the rate from Marquette. The total number of tons brought down that year was 1,195,234, an increase over the last year of 246,681 tons.

The winter charters of the year 1874 were made at nearly the same figures as for the year 1872, or $2 per ton from Escanaba to Cleveland, but at $2.75 instead of $2.85 as in that year from Marquette. But the evidence of a change in the times was soon apparent, for by June of that year freight had declined to $1.40 per ton from Escanaba to Cleveland, and $2 from Marquette. The closing figures of the year were at the price named from Escanaba, and at a further reduction of 25 cents, or $1.75 per ton from Marquette. There was also a falling off in

The Demand for Ore which caused this depression in the carrying price, as but 809,934 tons were brought down that year.

The winter charters of the year 1875 were at the closing rates of 1874, or $1.40 from Escanaba and $1.75 from Marquette. But the depressed condition of the trade was still further evident in the carrying rate being reduced during that year, so that it closed at $1.10 from Escanaba and $1.50 per ton from Marquette. The number of tons brought down, however, was slightly increased, being 881,166 tons, and 71,232 tons more than in the year before.

The winter charters of 1876 were made at $1.20 per ton from Escanaba and $1.50 from Marquette, but the financial depression was still more apparent and prices went lower, but rallied, especially in the last half of the month of October, and closed at $1.50 from Escanaba, and $2.25 per ton from Marquette. There was also a still further improvement in the number of tons shipped, being 993,311, against 881,116 reported the year before.

The history of the years 1877, 1878, and 1879 are very much alike, freights opening at about $1 each year from Escanaba and $1.30 and $1.40 from Marquette. Rates fluctuated some during each year, but always closed higher than at the opening. The advance made at the close of 1879 was rather remarkable, ranging from $2.10 to $2.90 from Escanaba, and from $3 to $4.25 per ton from Marquette. The number of tons brought down in those years was also remarkable for the

Increase Over Previous Years being for 1877, 1,025,129 tons; for the next year, 1,127,583 tons, and for the year 1879, 1,420,745 tons.

The winter charters of 1880, while not as high as the closing rates of the year before, were higher than in any year since 1874, being $1.85 per ton from Escanaba and $2.75 from Marquette. They ruled strong all through that year, and closed at $2 from Escanaba and $2.75 to $3 from Marquette. There was a still further boom in the shipments brought down, there being 1,975,602 tons. Season rates opened at better figures in the year 1881, $1.75 per ton being the starting off point from Escanaba and $2.45 from Marquette. The opening rate was not, however, fully maintained during the year and prices closed lower than at the opening, $1.10 to $1.30 being the figures from Escanaba and $2 to $2.25 from Marquette. But the shipments were still further increased until 2,305,133 tons was the amount landed at these ports.

The contracts made in the winter of 1882 were at the rate of $1.40 per ton from Escanaba to Cleveland and $1.75 to $2 from Marquette, and the engagements at the close of that year were almost precisely at the same figure except that a few charters were made from Escanaba to this port at $1.50. The total amount landed here that year was 2,900,431 tons.

In the winter of 1883 contracts were made for bringing ore from Escanaba to Cleveland at $1 to $1.10 per ton, and from Marquette at $1.15 to $1.25 per ton, but by the middle of the season better figures were obtained, and the closing prices were at $1.40 to $1.50 per ton from Escanaba and $1.75 to $2 per ton from Marquette. The total amount brought down last year was 2,300,351 tons.

In this connection it may be stated that the amount of ore brought to this port from 1854 to the present time is 22,589,626 tons.

*The bill of lading for this shipment, written by the late Peter White, of Marquette, is now hanging in the office of Oglebay, Norton & Co., of Cleveland.

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The Market Values of Ores

or the prices at which ores were sold in many of these years will also be given. The figures are gathered by a gentleman who has been long in the business and can be relied on in every particular. The figures given are simply the average price at which ores were sold during the years named. For the year 1857, the average selling price of ore per ton was $8; in 1858 it was $6.50; in 1859 it was $6; in 1860, 1861 and 1862 the average was the same each year, or $5.25 per ton; in 1863 it was $7.50; in 1864 it was $8.50; in 1865 it was $7.50; in 1866 it was $9.50; in 1867 it was $10.50; in 1868 and 1869 it was $8.25; in 1870 it was $8.50; in 1871 it was $8; in 1872 it was $9; in 1873 it was $12; in 1874 it was $9; in 1875 it was $7; in 1876 it was $6.75; in 1877 it was $6.50; in 1878 it was $5.50; in 1879 it was $6.25; in 1880 it was $9.25; in 1881 it was $9; in 1882 it was $9; and in 1883 it was $6.25 per ton. By comparing these figures with those paid for transportation it can be seen that the margin for other expenses and the value of the ore itself was exceedingly small. An equally interesting story is gathered on

The Moving Rates of Coal

from the lower to the upper ports or from Cleveland to Chicago and Milwaukee. One dollar and ten cents was paid on the opening of navigation in 1872 and the season closed at $2, the average for the season being $1.58. In 1873 the opening was at $1.25 and the closing at 60 cents, with the average at $1.20. The year 1874 opened at the very low rate of 50 cents, and closed at $1.25, making the average of that year 62 cents. Sixty-five cents was the first figure for the year 1875 and the closing 60 cents, making the average 77 cents. In the year 1876 rates again opened at 50 cents, but closed at $1.12, with the general average of 57 cents. The year 1877 opened below the rates of the year before, or at 45 cents, and closed at 90 cents, a single charter being made as low as 38 cents but the average was 55 cents. The year 1878 began at 35 cents, but advanced steadily until the close, when 73 cents was reached. The average this year was better than the opening figure, being 44 cents per ton. The year 1879 opened with a better rate than the year before, or 50 cents per ton, and advanced rapidly toward the close, until $1.28 per ton was reached. The average of that year was 72 cents. In 1880, 55 cents was the opening figure, and the closing $1.05, the average being 85 cents. The year 1881 opened with the best rates since 1872, or $1.05, and closed at $1.38, making the average $1.20.

PIG IRON SITUATION.

Gloomy conditions predominate in the iron trade, due in part to the proposed radical reductions in the tariff on iron and steel products and the expectation that the proposed tariff bill will not be enacted into a law until several months have passed. Further pessimistic sentiment may be attributed to the failure of recent price reductions to result in the development of business to any amount. There are many rumors of price cutting, pig iron stocks are piling high, the market is dull and prices are weak, with the expectation of many plants being closed and a general reduction in wages. An effort is being made to bring about concerted action to curtail production in the Pittsburg district and the Mahoning and Shenango valleys. Foundry iron is selling in the south at from $11 to $11.50 Birmingham for No. 2, and low prices are prevailing in the central west and in the east. Some irregularity has developed in steel bars, but for the most part the price remains 1.20c Pittsburg. The demand for sheets shows some improvement. Persistent rumors of structural steel selling below 1.30c Pittsburg are heard.

FUNNELLESS BATTLESHIP FOR ENGLAND

The keel plate of the British battleship Indefatigable, which is to be an advanced Invincible, was laid down at the Devonport dock yard recently.

The armament and speed of the new vessel are to be similar to those of the latest battleship cruisers, but she will be without funnels, and beyond her tripod masts, gun turrets and bridges, the upper deck will be as clear as was the case with the old sailing ships when all their canvas was stowed.

The construction of such a vessel is made possible by the recent development of the internal combustion engine and it is stated on good authority that the experiments which have been conducted by Vickers, Sons & Maxim for the adaptation of this type of engine to large ships have been so successful that the British admiralty has decided upon the construction of an entirely new type of battleship which will outdistance the Dreadnought quite as far as that vessel did its predecessors.

The new battleship will be a veritable floating fortress, the absence of funnels enabling it to move all its heavy guns in a complete circle and fire all of them on either broadside. Probably the new ship will be armed with 13.5-in. guns and will have a displacement of 21,000 tons and a speed of 25 knots.

NEW JAPANESE SUBSIDY LAW.

The new ship subsidy law in Japan is likely to result in the abandonment of the European service of the Nippon Yusen Kaisha, according to recent advices from that country. The bill is said to work greatly to the benefit of the new trans-Pacific line of the Osaka Shosen Kaisha and to the established trans-Pacific service of the Toyo Kisen Kaisha, but the Nippon Yusen Kaisha fought the passage of the bill from the beginning.

The new law provides that the minimum speed of subsidized steamers is to be 12 knots, and an additional subsidy of 18 per cent for every additional knot per hour will be paid, while with respect to ships employed in the new lines the subsidy is increased 25 per cent. This will make the fast steamers of the Toyo Kisen Kaisha, which developed 19 knots, receive the largest subsidy. The new line of the Osaka Shosen Kaisha will receive a navigation subsidy of 32¼ cents per thousand miles per ton, while the Nippon Yusen Kaisha will get 25 cents per ton.

NAMES OF NEW BATTLESHIPS.

The two new monster battleships for which provision was made by the last Congress, are to be named Arkansas and Wyoming. Secretary of the Navy Meyer in making the announcement classed the new vessels as "Dreadnought destroyers," as they are far more powerful ships than those of the Dreadnought type which have recently been added to the navy, being, in fact, larger than any warships afloat.

The two big ships have not yet been laid down and work cannot begin on them for some time, as the money for their construction is not available until July 1. They are to be each of 26,000 tons burden and will carry the heaviest batteries of any warships afloat. The choice of the names for the vessels so far in advance of their building or launching is unusual.

PERSONAL.

Lieut. Commander Hutchinson I. Cone has been appointed head of the Bureau of Steam Engineering of the navy, with the rank and pay of rear admiral. Commander Cone joined the Atlantic battleship fleet in its around-the-world cruise at San Francisco, where he assumed the duties of fleet engineer. Just previous to this he especially distinguished himself by taking the torpedo boat flotilla from Newport News to San Francisco in safety.

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TESTS OF WATERPROOF CEMENT.

The St. Louis Sampling & Testing Co. has made a report to the Meramec Portland Cement & Material Co., Bank of Commerce building, St. Louis, on their processes for producing a water-proof Portland cement, the conclusions of which are as follows:

As a convenient method of judging of the merits of the proposed process for waterproofing cement we may compare it (from the results of tests made thus far) with the standard requirements already given as necessary to be fulfilled before any such process can be accepted as entirely satisfactory. It is not intended of course that this will furnish final and altogether conclusive proof of the merits of the process. As already stated this is but a report giving results of what must be considered as a preliminary series of tests, leaving much still to be done on a more extended scale. Sufficient, however, has been accomplished to answer the inquiry for which this work was undertaken, and to entitle the process to respectful attention on the part of those interested and skilled in the preparation and use of cement.

1. The requirement that the waterproofing must be efficient seems to be met in a very satisfactory degree. The results of tests, as applied, show that the immersed samples, when removed from the water and quickly dried with a towel, gained slightly in weight, but the amount of this gain is comparatively small, even after long exposure, and the rate of gain is very slow. As compared with the results obtained with plain cement products, tested under similar conditions, the difference is very striking, and shows that the treatment proposed is remarkably efficient in giving resistance to the permeation of water.

While as yet there has been no opportunity to apply long time waterproofing tests, such tests as have been made furnish evidence of value, and indicate that good results may reasonably be expected even after very long immersion in water.

The following group of tests, selected as representative from a large number, shows by comparison the effect of immersion upon plain and waterproof cement products, in each case the test pieces having been prepard under similar conditions, except in the matter of waterproofing.

The immersion was total with one inch depth of water above the upper surface. Weights given are in grams.

Neat Whole Briquettes.

Duration of Immersion.

Dry Wt.	5 Min. Wt.	Gain.	30 Min. Wt.	Gain.	24 Hours. Wt.	Gain.	7 Days. Wt.	Gain.	14 Days. Wt.	Gain.	21 Days. Wt.	Gain.
Plain.												
126.0	137.0	11.0	139.0	13.0	140.0	14.0	140.5	14.5	.....	...	.....	...
132.5	144.0	11.5	146.5	14.0	147.5	15.0	148.0	15.5	.....	...	.....	...
Waterproof.												
134.5	136.0	1.5	136.0	1.5	137.0	2.5	137.0	2.5	137.0	2.5	137.0	2.5
136.0	137.0	1.0	137.0	1.0	137.0	1.0	137.0	1.0	.....	...	137.0	1.5
Half Briquettes.												
60.0	60.5	0.5	60.5	0.5	61.0	1.0	.....	....	.....	...	.....	...
61.0	61.5	0.5	62.0	1.0	62.0	1.0	.....	....	.....	...	.....	...

From the above it will be seen that the plain cement briquettes showed a gain of 11 and 11.5 grams in weight after 5 minutes immersion, while those of the waterproof cement gained only 1 and 1.5 grams in the same time; that water permeated the plain cement briquettes to the extent of 14.5 and 15.5 grams (over 11.5 per cent) while it reached only 1.5 and 2.5 grams (less than 1.5 per cent) in the waterproof briquettes. The half briquettes show practically the same results.

The following are selected as representative of a large number of briquettes showing the effect of waterproofing 1 to 2, 1 to 3, and 1-3-4.

Dry Wt.	5 Min. Wt.	Gain.	30 Min. Wt.	Gain.	24 Hours. Wt.	Gain.	48 Hours. Wt.	Gain.	26 Days. Wt.	Gain.
					1:2					
138.6	142.1	3.5	142.8	4.2	143.9	5.3	144.1	5.5	.....	...
116.9	119.8	2.9	120.6	3.7	121.4	4.5	121.6	4.7	.....	...
					1:3					
130.5	135.6	5.1	136.5	6.0	136.9	6.4	136.9	6.4	.....	...
129.4	134.5	5.1	135.5	6.1	.....	...	135.9	6.5	.....	...
146.0	149.0	3.0	.....	...	150.4	4.5	.....	...	152.0	6.0
					1:3:4				5 Days.	
142.0	147.0	5.0	148.0	6.0	148.5	6.5	.....	...	148.5	6.5

The above results were obtained with total immersion of waterproof cement briquettes and show that after a small amount of water is taken up the permeation practically ceases. On the other hand in every case the plain cement briquettes very quickly take up 9 and 10 grams of water and are wet through.

The accompanying photograph shows even better than figures the effect of the waterproofing. This was taken within half an hour after the half briquettes were split, and shows very plainly the readiness with which the water permeates in 30 minutes the mass of plain cement briquettes, and on the other hand the great resistance given by the waterproofing, no appearance of moisture being visible in the neat briquettes after total immersion for 48 hours.

In the case of the 1:2, 1:3 and 1:3:4 briquettes, those made waterproof show, when split, that the moisture has not penetrated more than about one-eighth of an inch from the exterior surfaces, even after 48 and 72 hours, and in fact as long as immersed. On the other hand the plain briquettes of similar make all show, when split, complete permeation of moisture within 30 minutes to 2 hours. Such evidence as these occular demonstrations is very convincing as to the resistance to water permeation which this waterproofing process imparts to cement products of all kinds.

2. The requirement that the waterproofing must be effective throughout the whole mass of concrete, is completely satisfied in this process, since the latter is applied for waterproofing cement before delivery for use, and it is intended that such cement shall be used for the whole mass of concrete. Nor should the additional expense in using the cement, made waterproof by this process, be a serious matter, considering the great advantages resulting from having the structural work in which it is used waterproof throughout.

3. That the waterproof treatment should be such that it can be applied in the manufacture of the cement is also most fully met. While the treatment is capable of being applied to the finished cement at any time it is especially intended that it shall be applied in the cement mills at the time of manufacture of the cement, and it is eminently adapted for application in this way. It will be appreciated that this is one of the many advantages the process possesses, and which simplifies the whole question of the use of a waterproof cement.

4. There is nothing used in this waterproof process which individually, or collectively as combined, could in any way affect the keeping qualities of the cement, and no other precautions are required beyond those which apply to the storing and handling of ordinary cement.

The only effect on the setting quality of the cement is a favorable one in that the ingredients used favor the control of the initial set to some ex-

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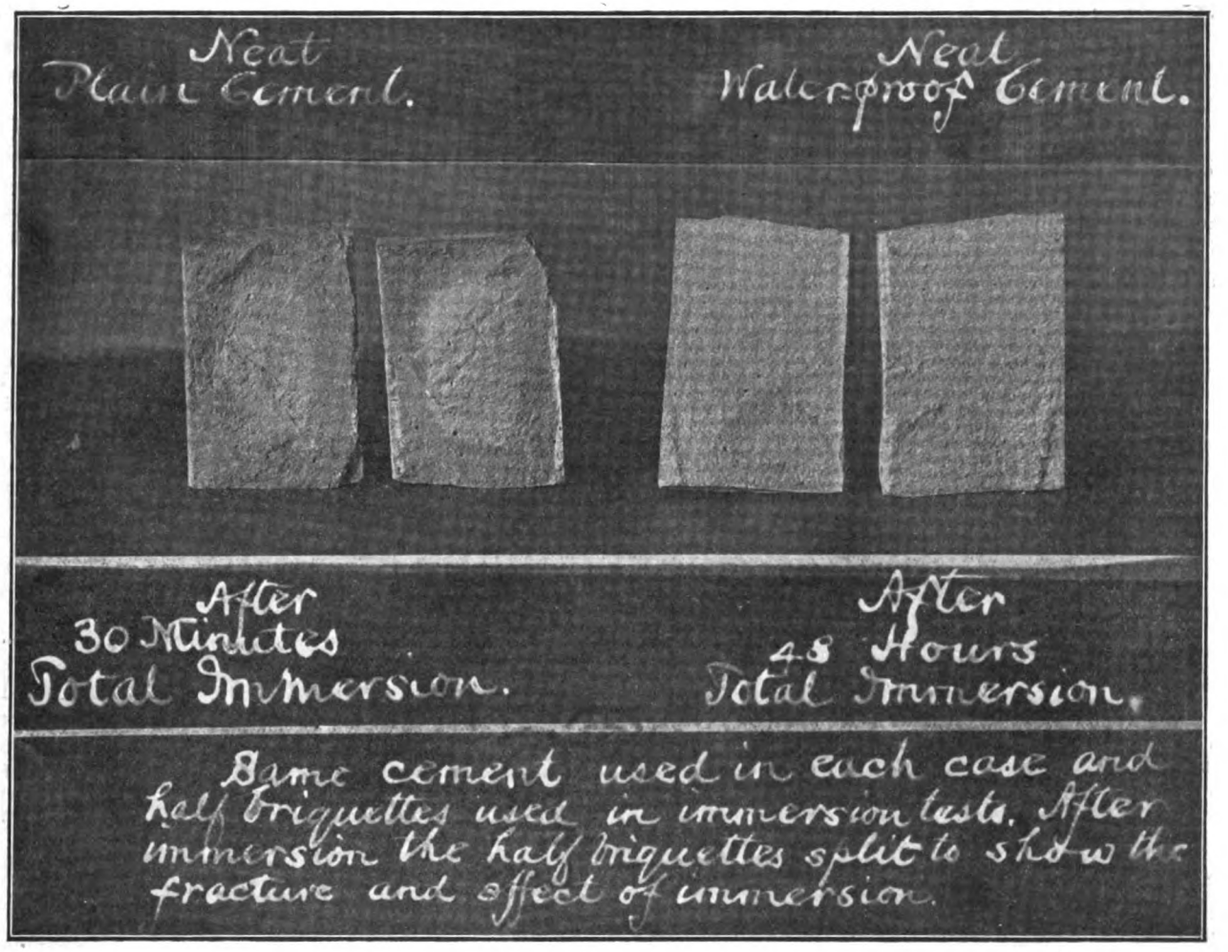

tent, entirely satisfactory results in this respect being secured with an addition in any case of not more than one-half of 1 per cent of gypsum or plaster of Paris. Repeated tests show that ground clinker to which no retarder has been added and with a flash set, is given a reliable initial set of one hour, to one hour and ten minutes, by addition of not over one-half of 1 per cent of gypsum with the waterproofing compound.

5. The results of numerous comparative tests, with plain cement and the same to which the process has been applied, show that, so far as regards the tensile strength, constancy of volume and specific gravity, the waterproof cement compares favorably with the plain. The strength of the waterproof cement in all mixtures and for all lengths of time is fully equal to that of the corresponding plain cement. In the constancy of volume tests the parts made with waterproof cement remain firm and hard and show no signs of cracking, distortion or disintegration whatever. As yet no compression tests have been made.

6. Organic substances likely to undergo any change or decomposition are not used, and the inorganic mineral substances used are in such stable condition as to insure that no deterioriation is likely to take place in the concrete due to their presence.

7. The requirement that the whole amount of ingredients used for waterproofing the cement should be so small that the total foreign matter in the cement, when put upon the market for use, will not exceed the best standard requirements, severe as it is for waterproofing cement, is fully satisfied under this process. An addition of not more than 2½ per cent is needed, of the total ingredients, to produce the required waterproofing, leaving one-half of 1 per cent for the addition of gypsum to complete the retarding of the initial set, (which is amply sufficient) before reaching the limit of 3 per cent total foreign matter at present required.

8. The requirement that the process in all its operations and conditions should be free from complex manipulations and narrow limitations is fully met. Indeed, simplicity throughout is one of the principal characteristics of this process. Besides providing the proper materials in suitable proportions, and a very simple treatment applied to these as a whole, it is only necessary to secure thorough and intimate mixture with the cement, which is done by machinery, of course, and in a reliable way. There is, therefore, every assurance that, in the application of the process, the results will be uniform and reliable.

9. It will be evident from what has been said of the process under 8 that little if anything in the way of machinery would be needed in addition to what is found in the cement mills as they are at present constructed and operated. The process could doubtless be applied at any existing plant in operation, without causing an hour's delay in the regular work, and with but a minimum expense incurred for any additional facilities that may be required.

10. The requirement as to the additional cost of the waterproofing treatment is very satisfactorily met. In a separate special report later on will be given full details as to the cost of applying the process. It will be sufficient at this time to state,

(Continued on page 33.)

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Modern Methods of Lake Navigation for the Beginner.

BY CAPT. GEORGE TRIMBLE.

How the Heavens Appear to Us.

The heavens appear to us like an immense dome that turns slowly over our heads. The stars seem to be tiny lights that are fastened on the inside of this dome. Tonight we might make a map of all the stars that appear to us at a certain hour and tomorrow night we would find these same stars back again. But they would be one degree farther to the westward each night. But they would keep the same form—the dipper would always resemble a dipper, etc. Occasionally, however, we see a very bright star that doesn't seem to stay in any particular place. It wanders around. This is a planet and its movement among the stars is caused by its revolution around the sun. We can't stand off in the distance and watch the actual movements of these worlds and therefore we can't make them seem as they really are. We are passengers on one of these moving planets and we can't see our earth move. The daily whirl of the earth makes everything in the heavens seem to rise in the east and set in the west. And the yearly revolution of the earth around the sun makes these heavenly bodies rise and set at a different time each night. The stars all come in regular time—four minutes earlier each night—but the rising time of the sun, planets and moon is different every night. The sun remains fixed, of course, but the revolution of the earth around the sun makes the sun appear to move just as a planet does. Therefore the sun changes its position among the stars just as a planet does.

How Astronomers Locate Heavenly Bodies.

A navigator locates a place on the earth by its latitude and longitude. An astronomer locates a heavenly body by its declination and right ascension. For purposes of measurement and location of heavenly bodies the sky is divided up with lines of latitude and longitude just the same as the earth is. But the terms declination and right ascension are used instead of latitude and longitude. All calculations are made on the understanding that the sky is just as it looks to us—an immense dome over our heads. In a former chapter we explained how the lines of latitude and longitude could be drawn on a ball. We will now take this ball, with all the lines of latitude and longitude on it, and stick a knitting needle through it at the poles. See Fig. 35.

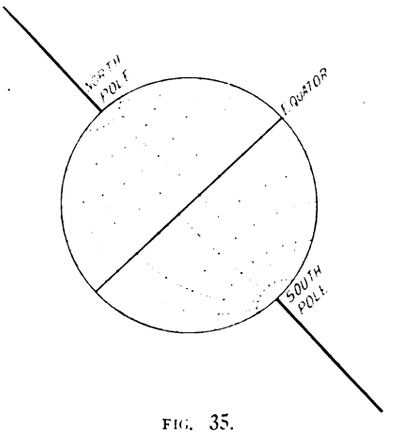

FIG. 35.

In order to make our model complete we must enclose this ball within another larger ball or globe. A perfectly round glass globe would do splendidly for the experiment. It must be made to turn on the knitting needle so that the north pole in the heavens will be directly over the earthly north pole. The inside of this glass globe will represent the heavens, as they appear to us. Spots to represent stars can be painted on the inside of the globe. In Fig. 36 we show our model as it now appears but with only half the outer globe in view.

You will notice that the heavenly north pole is directly over the earthly north pole—the knitting needle shows that. Then the heavenly equator is drawn directly over the earthly equator. If you were to stand on the earth's equator and look straight up you would be looking at the place in the sky where astronomers have drawn the celestial equator. We told you before that all places on the earth that are north of the equator are in north latitude. You can now understand that all heavenly bodies that are north of the celestial equator are in north declination. Declination simply means heavenly latitude.

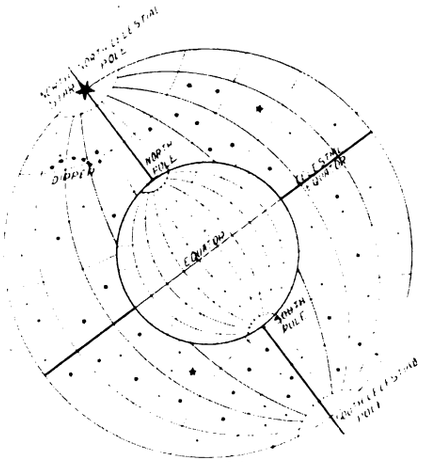

FIG. 36.

We have told you before that the earth is generally divided up by 24 standard meridians of longitude. These meridians are lines drawn from the north to the south on the earth. We will now divide the heavens in the same manner. You can call these lines by several names—either meridians of right ascension, meridians of heavenly longitude or hour-circles. They are generally called hour-circles. There are 24 of them and as the sun takes 24 hours to travel around the earth then she reaches one of these hour circles every hour. Now, for measuring longitude on the earth we had to have a first meridian, or starting point, and this was placed at Greenwich, Eng. Now we must also have a first hour-circle in the heavens. This heavenly first meridian is placed at the spot where the sun crosses the heavenly equator when she comes north on the 21st of March, each year. We all know that the sun comes north in the summer and goes back south in the winter. Or, correctly speaking, she appears to do so and all calculations of heavenly bodies are made with the understanding that they do as they appear to. The rush of the earth around the sun makes the sun appear to move because it is not possible for us to realize that the earth is moving.

The place where the sun crosses the line on the 21st of March is called the First Point of Aries. The first heavenly meridian or hour-circle cuts through here and goes north and south, to each pole. All measurements in the heavens start here. If any heavenly body is on this line its right ascension is 0 hours, 0 minutes, 0 seconds. Right ascension is figured

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in hours, minutes and seconds, instead of degrees.

Now remember that we are figuring on the understanding that the dome of the heavens turns over our heads every day. But, of course, the heavens really stand still while the earth does the whirling.

You can now understand that this heavenly first meridian, or the first hour-circle, swings over our heads every day. We will imagine that we can see this immense line pass over our heads. When it is directly over our heads we will take the time, by our watch. Then, as this great meridian swings past we will watch a star coming from the east, towards us. When it gets directly over our heads we will again look at our watch. The length of time since the first hour-circle has passed will then be this star's right ascension. The right ascension of any heavenly body is then its distance, in time, from the first hour-circle, or the first point of Aries. Sidereal time is set by the first point of Aries. When this point is directly over your head the sidereal clock should read 0 hours, 0 minutes, 0 seconds. How easy it then is to figure the right ascension of a star.

Now please remember that while we are learning just how heavenly bodies are located in the heavens we don't have to locate any of them ourselves. The Nautical Almanac does all this for us and really makes the study very easy after all. Now paint a few stars on the inside of the outer globe in your model and study them closely. You can see that the stars will not change their position at all. When the outer globe turns and takes the hour-circle with it it also takes the stars with it. Their right ascension and declination will always remain the same. (A very slight movement of the stars is caused by the precession of the equinoxes, explained farther on in this work.) But the sun, moon and planets will always be changing the positions. The earth and the other planets are continually rushing around the sun and this makes them all appear to wander in every direction among the stars.

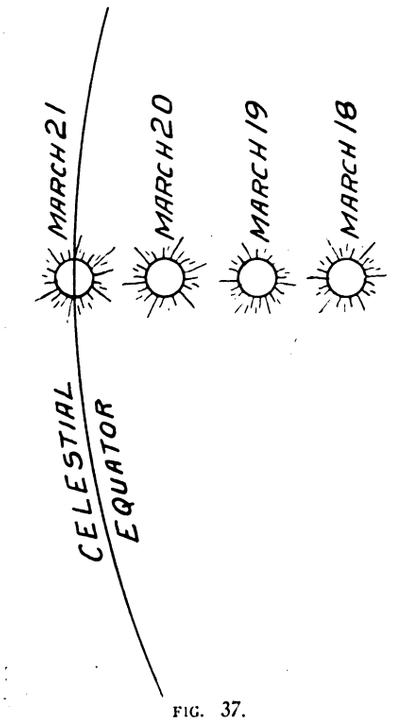

FIG. 37.

Fig. 37 shows the sun *crossing the line* on March 21. In other words, the sun is crossing the heavenly equator. The exact spot where the sun crosses is called the First Point of Aries. The first heavenly meridian cuts through here as shown in Fig. 38.

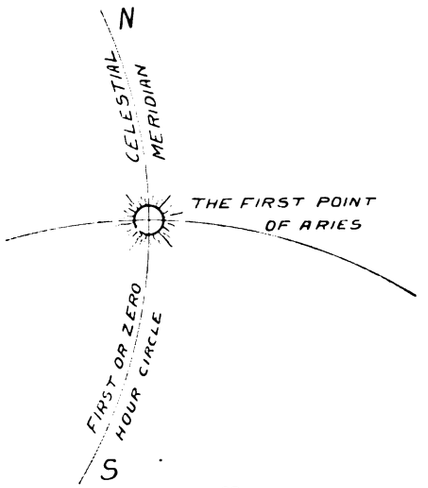

FIG. 38.

This crossing point has several names—the First Point of Aries, the Vernal Equinox, the Spring Equinox, the Greenwich of the Sky, etc. Several thousand years ago, when astronomers first laid out the plan of heavenly latitude and longitude, the sun crossed the line in the constellation Aries. The exact place of crossing was therefore called the First Point of Aries. But on account of the *"Precession of the Equinoxes"* the sun now crosses the line in the constellation Pisces. But the first name—The First Point of Aries—still remains. All about the Precession of the Equinoxes, etc., will be found farther along in this work.

How to Pick Out the Brightest Stars.

If the weather is clear nearly 3,000 stars can be seen at once with the naked eye. As we see only half of the dome of the heavens at once there must be nearly 6,000 stars in the heavens that can be seen without the use of a telescope. But an astronomer can find about 100,000,000 stars with his telescope.

For azimuth work we need only about one dozen of the brightest stars.

For the purposes of identification the stars are grouped together and each group is called a constellation. Most of the constellations were named by ancient astronomers and very few of them look like the things they were named after.

Constellations are generally given Latin names and each star in a constellation is designated by a Greek letter. But for the purpose of clearness we will designate each star by an English letter as they resemble Greek letters somewhat.

Constellations are given such names as Taurus, Aries, Gemini, Cancer, Leo, etc. The English names of these constellations would be The Bull, The Ram, The Twins, The Crab, and The Lion. When you are star-gazing don't try to find anything that resembles any of these. The ancient astronomers must have had great imaginations.

In the constellation Taurus we see seven stars. The brightest star is named Taurus A, then Taurus B, Taurus C, etc. Generally, however, the brightest star in each constellation has a proper name attached to it. The brightest star in Taurus is named Aldeberan. It would, therefore, have two names—Aldeberan, or Taurus A.

If it were possible for us to see the imaginary boundary lines that the astronomers have drawn in the heavens, to separate the constellations, the sky would look like a map of a state or county. Fig. 39 shows the

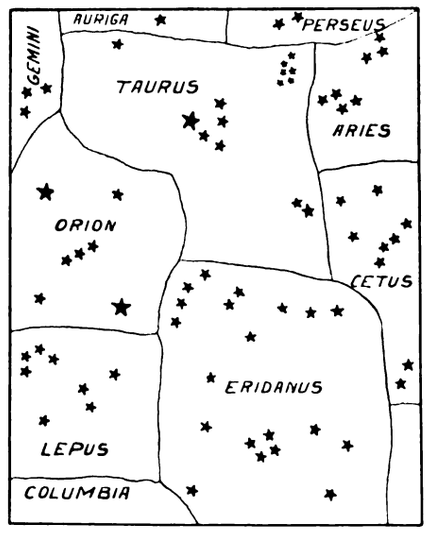

FIG. 39.

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manner in which several of our constellations are made.

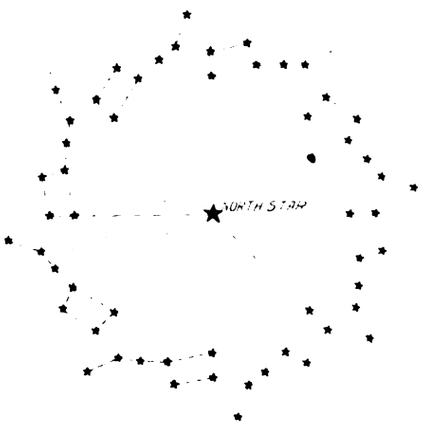

FIG. 40.

Of course there are hundreds of other stars in these constellations that we do not see, as astronomers use telescopes and form the constellations to take in the many stars that the telescope shows grouped together.

The constellation of the Big Dipper looks something like a dipper but is only a part of a larger constellation called Ursa Major.

Now we don't need to bother ourselves much about the constellations. We can pick out the first magnitude stars without knowing anything about the constellations if we wish.

In order to locate almost any of our stars we must know the Big Dipper when we see it. But nearly everyone knows just where to look for that.

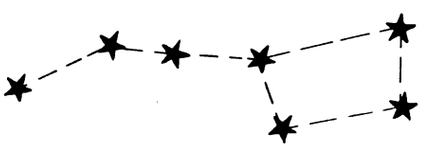

FIG. 41.

It never sets, but travels in a circle around the north star every night. Get some one to show you the Big Dipper and the start is made. But you can't use any of the stars in the dipper for azimuth work because there are no bearings given in the azimuth book for anything as far north as that. But the stars of the Big Dipper form ranges that can be used for locating the other stars.

The Big Dipper and the North Star (Polaris).

The two stars that form the side of the bowl of the dipper form a range that always points directly at the North Star.

The Big Dipper takes a daily whirl around the north star, as shown in Fig. 40.

Of course, actually, the dipper does not change position, but the daily whirling of the earth makes it appear to change. You will notice that no matter where the Dipper is the two stars that form the outside of the bowl always point to the north star.

You should make a little measuring stick for the stars. The two stars that form the brim of the dipper are about 10 degrees apart. Hold a stick at arm's length and cut notches in it to correspond with those two stars. This will show you 10 degrees of the sky distance. Cut more notches to show you 10, 20 and 30 degrees. The North Star is nearly 30 degrees from the Dipper.

A picture of the Dipper as we see it every night is shown in Fig. 41.

When you look for the Big Dipper you are just as likely to see it upside down as any other way. So don't expect to always see it as shown in Fig. 41.

The stars that we will now attempt to find are named below. Their proper names will be the ones that we will use, but we also give their constellation names in order that you may better understand the Nautical Almanac.

Eleven of the brightest stars in the heavens. These can all be used for azimuth work:

Arcturus (Bootes A).
Spica (Virginis A).
Aldebaran (Taurus A).
Rigel (Orion B).
Betelgerz (Orion A).
Altair (Aquila A).
Sirius (Canis Major A).
Procyon (Canis Minor A).
Pollux (Gemini A).
Regulus (Leo A).
Antares (Scorpio A).

Astronomers call these first magnitude stars. First magnitude are the brightest stars, then come second magnitude stars, etc. There are about 20 first magnitude stars in the heavens but those given here are the only ones that we have figures for in the azimuth book. All these stars cannot be seen every night. They rise four minutes earlier each night and at certain times of the year, therefore, they pass over our heads in the daytime.

The best time to identify a star is when it is rising or just after it has risen. It is more nearly alone then as the atmosphere near the horizon obliterates the multitudes of small stars that are plainly visible higher up in the sky. Those stars that rise exactly in the east are above the horizon about 12 hours, and remain below the horizon for the other 12 hours. Those stars that rise and set away to the southward of us spend a longer time below the horizon than they do above it. And those toward the northward of us spend a longer time above the horizon than below it. Some (as in the case of the Big Dipper) never set at all. The North Star never changes its position in the sky. It is at the north pole of the heavens.

We have prepared a table giving the time of rising and setting and the meridian passage of these 11 stars for the first day of each month. As a star rises four minutes earlier each night you can easily figure the time of rising and setting for the particular night you wish.

The time of rising given is the sun time of the locality that you are in. But you must not expect these stars to appear just at the minute given as there are different conditions that will affect these calculations. Fifteen minutes should be allowed either way. A star will rise earlier the farther north you get so our table is made for latitude 45—which should make a good average time for rising all over the lakes. A star passes the meridian by sun time the same the world over. If the Nautical Almanac tells you that a star passes the meridian at Greenwich, Eng., at 8 p. m., then it will pass your meridian at 8 p. m. If a star passes the meridian at Cleveland at 8 p. m., it will pass the meridian at Duluth at 8 p. m. Of course Cleveland sun time is not the same as Duluth sun time. The Nautical Almanac would mean 8 p. m. by Greenwich time while the star passes your meridian at 8 p. m. by your time.

Taking the stars in the order given in our list we will locate Arcturus first.

Arcturus.

Find the Big Dipper. Follow the curve of the handle around for 30 degrees and you find Arcturus—thus. See Fig. 42.

FIG. 42.

Spica.

Find Arcturus as shown above and follow the same circle around for

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30 degrees more and you find Spica—thus. See Fig. 43.

FIG. 43.

But there are times when you cannot find either Arcturus or Spica because they are below the horizon. The dipper is there pain enough but it might be in the position shown in Fig. 44. Follow the dipper handle and you will come to the horizon before you reach Arcturus or Spica. They will rise later when the dipper rises higher.

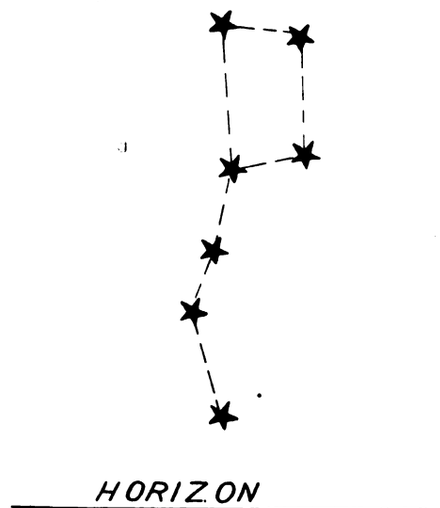

FIG. 44.

Spica can also be found by ranging across the dipper bowl as shown in Fig. 45.

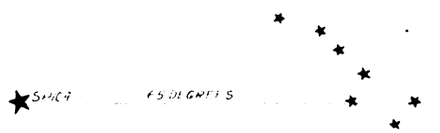

FIG. 45.

Pollux.

Pollux is one of the Heavenly Twins, two stars in the constellation Gemini. The other star is named Castor but we cannot use it even though it is so close to Pollux. It is just outside the belt for which we have azimuth tables. Pollux is shown in Fig. 46, but it can be located in another way. Range across the Dipper bowl as shown in Fig. 46. Pollux rises about 30 degrees north of exact east.

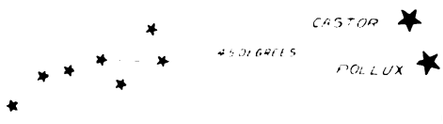

FIG. 46.

Altair

Altair is seen only in the morning until April 1 when it rises at midnight. It rises about eight degrees north of exact east. We canont get a range from the Dipper for Altair but it is easily picked out if you watch the list of times of rising and setting. Altair is the center one of three fairly bright stars. See Fig. 47. Altair is the only very bright star in this region of the sky and you will have no trouble in identifying it.

FIG. 47.

Altair and its Two Companions.

Before trying to locate any more stars we will give the list of times of rising, meridian passage, and setting of our 11 navigational stars in order that we may know just where to look for them. This list will tell you just whether the star you wish to locate is above or below the horizon.

The meridian passage means, its passage over the meridian on which you stand. The sun passes your meridian at noon, by your sun time. The times given here are for the first of each month. Remember that a star rises four minutes earlier each day. If a star rose at 8 p. m. on the first day of the month it would rise at 7 p. m. on the 15th, etc.

In the list you will notice that, in some places, the time is not given. This is because it either rose or set in the daytime, when you would not be able to observe it.

The rising and setting times of the planets is given farther along in this work. All the calculations given in this list were arrived at by computation.

This list of times of rising and setting of the stars can be used for any year. Each star will rise next year at the same time that it did this year. But planets will not do so. We must compute the times of rising and setting of the planets every year. Therefore the list shown farther along in this work, giving the planets' movements, is for the present year (1909) only. But after a short time you will be able to locate the planets, each year, without needing a list. As there are only four visible planets in the sky we will not be bothered much by them.

Following this list you will find another list that gives you the names of the stars you can use each month. Not all of our 11 stars can be seen every night in the year. Some of them are above the horizon only in the daytime, during some months. During June only only five of them can be used while for other months you can use as many as 10. Of course some of them can be used for only a few hours after sundown or just before sunrise while others can be seen the whole night through. Our list will show you that.

ARCTURUS.

Mean Sun Time.

Date	Rises	Passes Meridian	Sets
Jan. 1...	12:07 A. M.	7:31 A. M.	.....
Feb. 1..	12:07 P. M.	5:31 A. M.	.....
Mar. 1..	8:07 P. M.	3:31 A. M.	.....
Apr. 1..	6:07 P. M.	1:31 A. M.	.....
May 1..	.....	11:31 P. M.	6:55 A. M.
June 1..	.....	9:31 P. M.	4:55 A. M.
July 1..	.....	7:31 P. M.	2:55 A. M.
Aug. 1..	.....	5:31 P. M.	12:55 A. M.
Sept. 1..	.....	.....	10:55 P. M.
Oct. 1...	6:07 A. M.	.....	8:55 P. M.
Nov. 1..	4:07 A. M.	.....	6:55 P. M.
Dec. 1...	2:07 A. M.	.....	4:55 P. M.

Note—Blank spaces indicate daylight.

SPICA.

Mean Sun Time.

Date	Rises	Passes Meridian	Sets
Jan. 1..	1:24 A. M.	6:40 A. M.	.....
Feb. 1..	11:24 P. M.	4:40 A. M.	.....
Mar. 1..	9:24 P. M.	2:40 A. M.	.....
Apr. 1..	7:24 P. M.	12:40 A. M.	5:56 A. M.
May 1..	5:24 P. M.	10:40 P. M.	3:56 A. M.
June 1..	.....	8:40 P. M.	1:56 A. M.
July 1..	.....	6:40 P. M.	11:56 P. M.
Aug. 1..	.....	.....	9:56 P. M.
Sept. 1..	.....	.....	7:56 P. M.
Oct. 1..	.....	.....	5:56 P. M.
Nov. 1..	5:24 A. M.	.....	.....
Dec. 1..	3:24 A. M.	.....	.....

Note—Blank spaces indicate daylight.

ALDEBARAN

Mean Sun Time.

Date	Rises	Passes Meridian	Sets
Jan. 1..	.....	9:52 P. M.	5:00 A. M.
Feb. 1..	.....	7:52 P. M.	3:00 A. M.
Mar. 1..	.....	5:52 P. M.	1:00 A. M.
Apr. 1..	.....	.....	11:00 P. M.
May 1..	.....	.....	9:00 P. M.
June 1..	.....	.....	.....
July 1..	2:44 A. M.	.....	.....
Aug. 1..	12:44 A. M.	.....	.....
Sept. 1..	10:44 P. M.	5:52 A. M.	.....
Oct. 1..	8:44 P. M.	3:52 A. M.	.....
Nov. 1..	6:44 P. M.	1:52 A. M.	.....
Dec. 1..	4:44 P. M.	11:52 P. M.	7:00 A. M.

Note—Blank spaces indicate daylight.

RIGEL.

Mean Sun Time.

Date	Rises	Passes Meridian	Sets
Jan. 1..	5:05 P. M.	10:31 P. M.	3:57 A. M.
Feb. 1..	.....	8:31 P. M.	1:57 A. M.
Mar. 1..	.....	6:31 P. M.	11:57 P. M.
Apr. 1..	.....	.....	9:57 P. M.
May 1..	.....	.....	7:57 P. M.
June 1..	.....	.....	.....
July 1..	.....	.....	.....
Aug. 1..	3:05 A. M.	.....	.....
Sept. 1..	1:05 A. M.	.....	.....
Oct. 1..	11:05 P. M.	4:31 A. M.	.....
Nov. 1..	9:05 P. M.	2:31 A. M.	.....
Dec. 1..	7:05 P. M.	12:31 A. M.	5:57 A. M.

Note—Blank spaces indicate daylight.

BETELGERZ.

Mean Sun Time.

Date	Rises	Passes Meridian	Sets
Jan. 1..	4:41 P. M.	11:11 P. M.	5:41 A. M.
Feb. 1..	.....	9:11 P. M.	3:41 A. M.
Mar. 1..	.....	7:11 P. M.	1:41 A. M.
Apr. 1..	.....	5:11 P. M.	11:41 P. M.
May 1..	.....	.....	9:41 P. M.
June 1..	.....	.....	.....
July 1..	4:41 A. M.	.....	.....
Aug. 1..	2:41 A. M.	.....	.....
Sept. 1..	12:41 A. M.	7:11 A. M.	.....
Oct. 1..	10:41 P. M.	5:11 A. M.	.....
Nov. 1..	8:41 P. M.	3:11 A. M.	.....
Dec. 1..	6:41 P. M.	1:11 A. M.	.....

Note—Blank spaces indicate daylight.

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ALTAIR.

Mean Sun Time.

Date	Rises	Passes Meridian	Sets
Jan. 1..	6:34 A. M.	.....	7:44 P. M.
Feb. 1..	4:34 A. M.	.....	5:44 P. M.
Mar. 1..	2:34 A. M.	.....	.....
Apr. 1..	12:34 A. M.	.....	.....
May 1..	10:34 P. M.	5:09 A. M.	.....
June 1..	8:34 P. M.	3:09 A. M.	.....
July 1..	6:34 P. M.	1:09 A. M.	.....
Aug. 1..	.....	11:09 A. M.	5:44 A. M.
Sept. 1..	.....	9:09 P. M.	3:44 A. M.
Oct. 1..	.....	7:09 P. M.	1:44 A. M.
Nov. 1..	.....	5:09 P. M.	11:44 P. M.
Dec. 1..	.....	.....	9:44 P. M.

Note—Blank spaces indicate daylight.

SIRIUS.

Mean Sun Time.

Date	Rises	Passes Meridian	Sets
Jan. 1..	7:11 P. M.	12:02 A. M.	4:53 A. M.
Feb. 1..	5:11 P. M.	10:02 P. M.	2:53 A. M.
Mar. 1..	.....	8:02 P. M.	12:53 A. M.
Apr. 1..	.....	6:02 P. M.	10:53 P. M.
May 1..	.....	.....	8:53 P. M.
June 1..	.....	.....	.....
July 1..	.....	.....	.....
Aug. 1..	.....	.....	.....
Sept. 1..	3.11 A. M.	.....	.....
Oct. 1..	1:11 A. M.	.....	.....
Nov. 1..	11:11 P. M.	4:02 A. M.	.....
Dec. 1..	9:11 P. M.	2:02 A. M.	.....

Note—Blank spaces indicate daylight.

PROCYON.

Mean Sun Time.

Date	Rises	Passes Meridian	Sets
Jan. 1..	6:33 P. M.	12:55 A. M.	.....
Feb. 1..	.....	10:55 P. M.	5:17 A. M.
Mar. 1..	.....	8:55 P. M.	3:17 A. M.
Apr. 1..	.....	6:55 P. M.	1:17 A. M.
May 1..	.....	.....	11:17 P. M.
June 1..	.....	.....	9:17 P. M.
July 1..	.....	.....	7:17 P. M.
Aug. 1..	4:33 A. M.	.....	.....
Sept. 1..	2:33 A. M.	.....	.....
Oct. 1..	12:33 A. M.	6:55 A. M.	.....
Nov. 1..	10:33 P. M.	4:55 A. M.	.....
Dec. 1..	8:33 P. M.	2:55 A. M.	.....

Note—Blank spaces indicate daylight.

POLLUX.

Mean Sun Time.

Date	Rises	Passes Meridian	Sets
Jan. 1..	.....	1:00 A. M.	.....
Feb. 1..	.....	11:00 P. M.	7:10 A. M.
Mar. 1..	.....	9:00 P. M.	5:10 A. M.
Apr. 1..	.....	7:00 P. M.	3:10 A. M.
May 1..	.....	.....	1:10 A. M.
June 1..	.....	.....	11:10 P. M.
July 1..	4:50 A. M.	.....	9:10 P. M.
Aug. 1..	2:50 A. M.	.....	.....
Sept. 1..	12:50 A. M.	.....	.....
Oct. 1..	10:50 P. M.	7:00 A. M.	.....
Nov. 1..	8:50 P. M.	5:00 A. M.	.....
Dec. 1..	6:50 P. M.	3:00 A. M.	.....

Note—Blank spaces indicate daylight.

REGULUS.

Mean Sun Time.

Date	Rises	Passes Meridian	Sets
Jan. 1..	8:33 P. M.	3:24 A. M.	.....
Feb. 1..	6:33 P. M.	2:24 A. M.	.....
Mar. 1..	.....	12:24 A. M.	.....
Apr. 1..	.....	10:24 P. M.	5:15 A. M.
May 1..	.....	8:24 P. M.	3:15 A. M.
June 1..	.....	6:24 P. M.	1:15 A. M.
July 1..	.....	.....	11:15 P. M.
Aug. 1..	6:33 A. M.	.....	9:15 P. M
Sept. 1..	4:33 A. M.	.....	7:15 P. M.
Oct. 1..	2:33 A. M.	.....	.....
Nov. 1..	12:33 A. M.	7:24 A. M.	.....
Dec. 1..	10:33 P. M.	5:24 A. M.	.....

Note—Blank spaces indicate daylight.

ANTARES.

Mean Sun Time.

Date	Rises	Passes Meridian	Sets
Jan. 1..	4:41 A. M.	.....	.....
Feb. 1..	2:41 A. M.	.....	.....
Mar. 1..	12:41 A. M.	4:43 A. M.	.....
Apr. 1..	10:41 P. M.	2:43 A. M.	.....
May 1..	8:41 P. M.	12:43 P. M.	4:45 A. M.
June 1..	.....	10:43 P. M.	2:45 A. M.
July 1..	.....	8:43 P. M.	12:45 A. M.
Aug. 1..	.....	6:43 P. M.	10:45 P. M.
Sept. 1..	.....	.....	8:45 P. M.
Oct. 1..	.....	.....	6:45 P. M.
Nov. 1..	.....	.....	.....
Dec. 1..	.....	.....	.....

Note—Blank spaces indicate daylight.

The Stars We Can Use Each Month.

January—	Antares
Aldebaran	Altair
Rigel	July—
Betelgerz	Regulus
Sirius	Spica
Procyon	Arcturus
Pollux	Antares
Regulus	Altair
Spica	August—
Arcturus	Spica
February—	Arcturus
Aldebaran	Altair
Rigel	Aldebaran
Betelgerz	September—
Sirius	Arcturus
Procyon	Altair
Pollux	Aldebaran
Regulus	Rigel
Spica	Betelgerz
Arcturus	Sirius
March—	Procyon
Aldebaran	Pollux
Rigel	October—
Betelgerz	Altair
Sirius	Aldebaran
Procyon	Rigel
Pollux	Betelgerz
Regulus	Sirius
Spica	Procyon
Arcturus	Pollux
April—	Regulus
Rigel	Arcturus
Sirius	November—
Procyon	Altair
Pollux	Aldebaran
Regulus	Rigel
Spica	Betelgerz
Arcturus	Sirius
Antares	Procyon
Altair	Pollux
May—	Regulus
Sirius	Arcturus
Procyon	Spica
Pollux	December—
Regulus	Altair
Spica	Aldebaran
Arcturus	Rigel
Antares	Betelgerz
Altair	Sirius
June—	Procyon
Regulus	Pollux
Spica	Regulus
Arcturus	Arcturus

Rigel, Betelgerz and Sirius.

The constellation Orion is one of the most conspicuous constellations in the heavens and one needs to be shown it but once and it is never forgotten. It rises in the southeast and sets in the southwest. It contains more bright stars than any other single group, two of them being the stars that we use, Rigel and Betelgerz. And just below this constellation and a little to the left we find the brightest star in the heavens—Sirius. The constellation Orion is so conspicuous that we can use it to find several other of our navigational stars, such as Aldebaran, Procyon and Pollux.

Fig. 48 shows the constellation Orion in the southeastern sky.

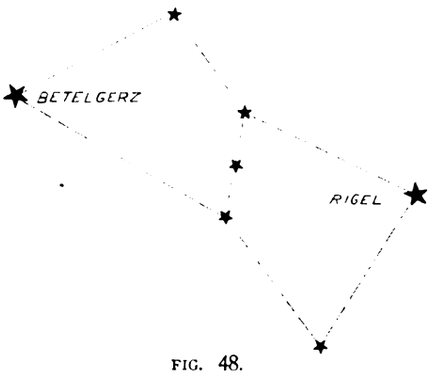

FIG. 48.

You need no range to find the constellation Orion. Look in your list for the times of rising of Rigel and Betelgerz and you will know when to expect it.

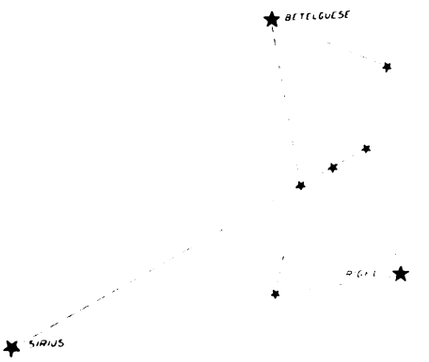

FIG. 49.

The constellation Orion looks like Fig. 49 when on the meridian. The three stars in the center point to Sirius below.

It might be interesting to know that the celestial equator passes about midway between Betelgerz and **Rigel.** Therefore Betelgerz is in north declination and Rigel is in south declination.

The constellation Orion is of no use to the lake navigator until the fall months as it is above the horizon only in daylight. On August 1 its first star rises shortly before 3 a. m. On Sept. 1 it rises shortly after midnight and after that these stars are the brightest that you can find and can be used until morning.

Aldebaran.

During the months of May and June Aldebaran is above the horizon only in the daytime. July 1 he rises at 2:44 a. m., and therefore can be used for a short time before daylight.

There is a cluster of very small stars in the sky that many people call the little dipper, but which astronomers call the Pleiades. If you happen to know where this little dipper is you will have no trouble in locating Aldebaran. Fig. 50 shows how Alde-

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baran and the Pleiades look in the eastern sky.

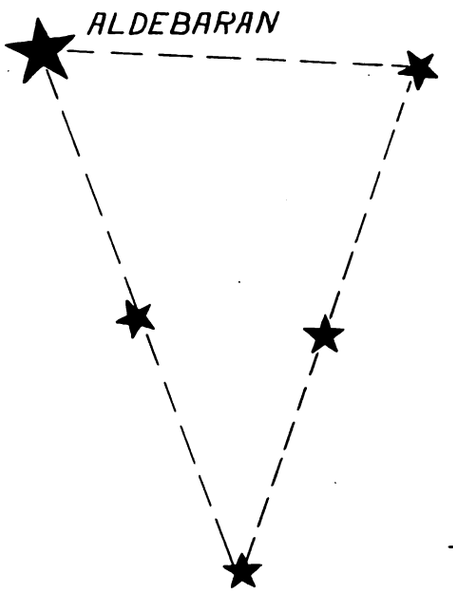
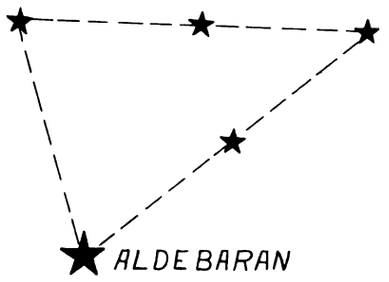


FIG. 51.



HORIZON

FIG. 50.

Aldebaran rises just a little north of east. Look up the time of rising in the list and then watch for the coming of the V-shaped cluster shown in the former cut. Fig. 51 shows how Aldebaran looks in the west just before setting. Remember that all groups of stars look different in the western sky than they do in the eastern. They appear tilted at a different angle, just as is shown in the cuts of the big dipper around the north star.

Aldebaran in the Western Sky.

Out of the 11 bright stars that we see you will find six of them clustered fairly close together. Fig. 52 shows them in the eastern sky about one hour after Sirius has risen. Pollux is one of the Heavenly Twins. The other twin (Castor) is shown just above Pollux.

But there are many summer months that you cannot see the above stars rise as shown on the cut because they rise during daylight. But look for them during the morning hours of August and September. On Oct. 1 the whole bunch can be seen in the east about midnight.

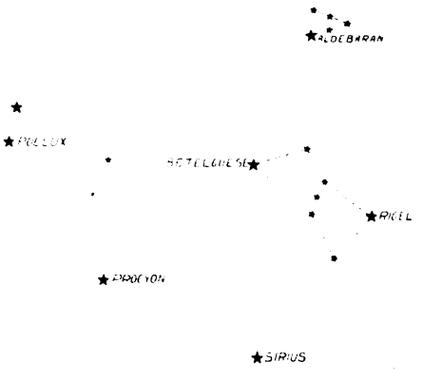


FIG. 52.

Regulus.

Regulus is at the end of a group of stars called the sickle. The sickle is part of the constellation Leo, shown below, and really resembles a sickle. It stands up in the sky and looks very much like Fig. 53.

The constellation Leo as it appears in the sky looks like Fig. 54. Leo means Lion. The ancient astronomers figured that this constellation resembled a lion.

This constellation rises just a little north of east. Regulus cannot be used by lake navigators during August and the first part of September as it is above the horizon only in daylight. On Oct. 1 it rises about 2:30 a. m.

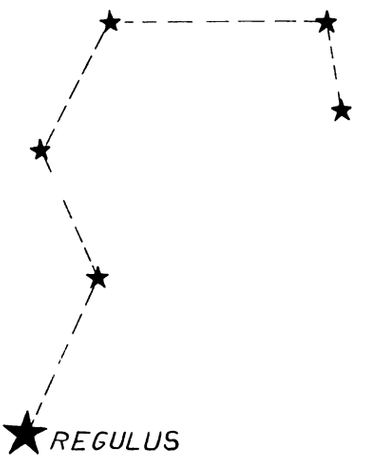


FIG. 53.

To find Regulus, range down from the dipper as shown in Fig. 55. This will not lead you direct to Regulus but near enough to find him. Measure off about 40 degrees. This will land you

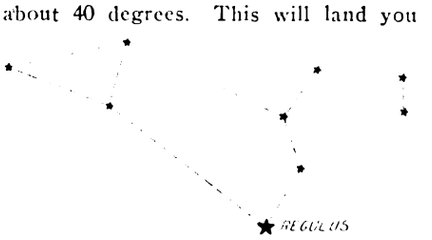


FIG. 54.

on the back of the lion. During 1909 you might be puzzled by the appearance of a very bright star just below the constellation Leo. This is the planet Jupiter and he will gradually move away.

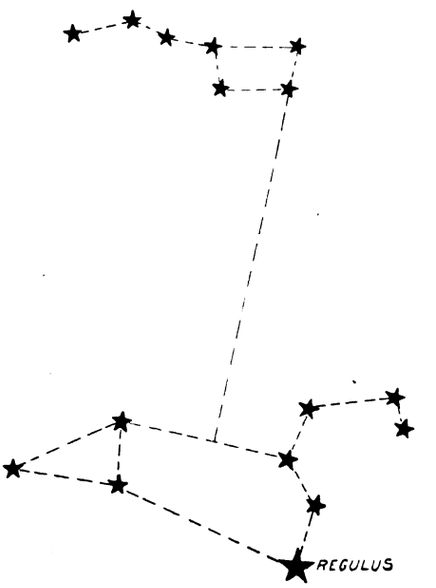


FIG. 55.

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Sirius.

Sirius is a southern star and makes his track across the heavens away to the south of us. He rises in a southeasterly direction and sets in the southwest. The best way to find him is to range down from the three center stars shown in Fig. 49. Sirius is so far south that he is below the horizon longer than he is above it. When he is on the meridian he is only about one-third of the way up to the zenith (the zenith is the point directly over our heads).

Antares.

Antares is the most southern star that we have to deal with and makes a very low circle in the sky. It is so far south that it shows above the horizon for only about eight hours. It rises in the southeast and sets in the southwest. Antares is in constellation Scorpius (the scorpion). This constellation probably does look something like a scorpion. See Fig. 56.

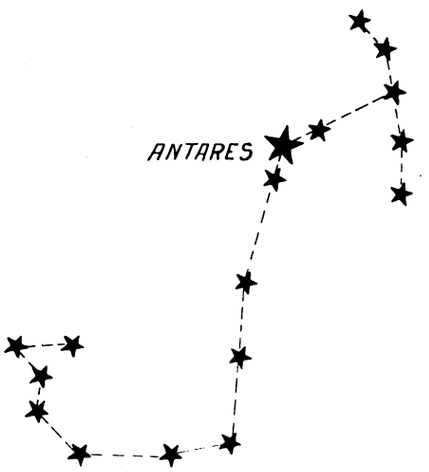

FIG. 56.

The Constellation Scorpius.

The tail, or lower part, sweeps so close to the southern horizon that it cannot always be seen, especially during the smoky season. This constellation is so conspicuous that you need no ranges to find it. Get the time of rising and setting from the list and then look for it in the southern skies.

The Subject of Applying Deviation.

In the MARINE REVIEW for March 11, on page 31, figure 25 shows a problem on a pelorus slate. The deviation of the compass is shown as 7 degrees east but should have been shown as 7 degrees west. This was merely an error in writing as the advanced student doubtless perceives. You port your boat seven degrees and would swing her from the course B to the course A. A student is often made to believe that the subject of applying deviation is very confusing but it has no terrors for lake navigators. A simple little pasteboard contrivance is often used that will name the deviation at a glance and will also show just which way to swing the ship in order to correct the course. It can be made in a few minutes with a little cardboard and a pencil. If you have any doubts as to the correct method of applying deviation you had better make one. After using it a short time you will not further need it. A description of this little instrument is given here.

Get two pieces of cardboard and cut them perfectly round. One should be cut a little smaller than the other. Now around the edge of each of these cards mark the degrees, in the same manner as the outer edge of a pelorus dial is marked, with 0 at north and 180 at south. Fasten the two cards together, the smaller card on top, see Fig. 57. The degree marks on the card underneath will show just clear of the edge of the smaller card. Have a pin in the center, so that you can swing the smaller card around. The top card will represent your pelorus or compass, the bottom card represents the circle of the horizon.

Now, for example, we will say that you have found that the correct magnetic bearing of the sun is 129 E. But your pelorus gives a bearing of the sun as 136 E. Now put the 136 on your top card directly in line with the 129 on the bottom card. Now how would you swing the top card in order to make the 129 on the top card correspond with the 129 on the bottom card? Try it. You would have to swing your ship in just the same direction. Move the

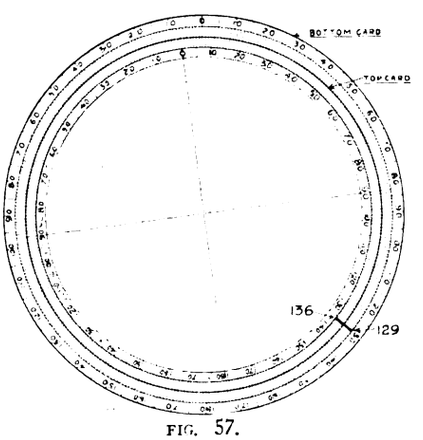

FIG. 57.

top card seven degrees to the right and all the figures on the top card will agree with those on the bottom. 129 on the upper card will be directly in line with 120 on the bottom card. While you have to twist the upper card to the right, seven degrees, to make it correspond with the lower card you will also have to swing your ship seven degrees to the right to correct your course.

This little deviation card is very easily made and will prevent you from ever applying the deviation the wrong way. And you can see at a glance whether the deviation is east or west. You will notice that 0 on the smaller card is to the westward of 0 on the larger card. As the smaller card represents your compass this shows you at once that you have westerly deviation. No great pains need be taken to make accurate degree marks on these cards. They are used merely for proving your problem and you can write the degrees on easily with a pen or pencil, so long as the degrees are all shown.

Try another example:

Take a bearing of the sun. We will suppose your pelorus shows this bearing to be 95. But you find that the correct azimuth is 90. Remember that the upper card represents your pelorus,

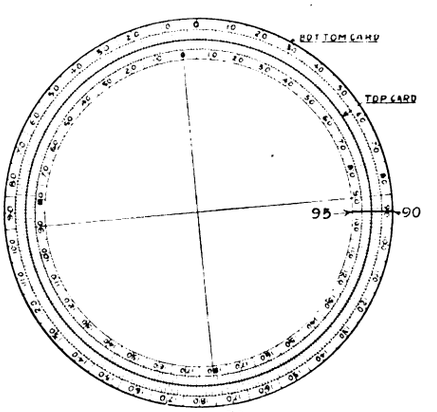

FIG. 58.

the lower or larger card represents the circle of the horizon. Place the 95 on the upper card directly in line with 90 on the lower card. see Fig. 58. One glance at the card will prove to you that the deviation is 5 degrees west and that you must twist the smaller card to the right to correct it. By turning it five degrees to the right you make the figures on both cards correspond. By turning your ship five degrees to the right you correct your course.

The Darlington Forge Co., Manchester, Eng., has secured the contract for furnishing the 160-ton stern frames and rudder brackets of the White Star Line's new liners Olympic and Titanic, as well as for the immense rudders, weighing 100 tons each. These are the heaviest castings ever undertaken anywhere. The lower portion of each rudder frame will be of cast steel and the other portions of hydraulic-pressed ingot steel.

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(Continued from page 25.)

however, that the cost at present market values of the raw material required is such that, with the low cost for applying them to the cement, the waterproof cement produced by this process could be put upon the market on terms that should make it readily available for very general use.

Conclusion.

From the above it will be seen that, so far as the present series of tests have resulted, the process meets all the requirements set as a standard, and meets them in a very satisfactory manner. In view of this we feel justified in recommending the process as one in every way worthy of the serious attention of all who are interested and skilled in the manufacture and use of Portland cement.

It is desirable, however, that in order to secure such conclusive and convincing proofs of the merits of the process as will be necessary, a more extended series of tests be now applied, covering the preparation of large enough test pieces to prove the waterproof results in concrete of full working size of aggregate and in all proportions likely to be employed. We would recommend also that, with some improved facilities which can readily be added here at our plant for grinding clinker and applying the waterproofing process on a considerable scale, sample lots of 50 pounds, or larger if necessary, be prepared of the finished product for suitable distribution so that those whose opinion is entitled to weight in such matters may be satisfied by their own tests of the merits of this important and, likely to prove, most useful process.

CHICAGO DOCK PLANS.

A proposal has been made that the city of Chicago go into partnership with dock companies for the purpose of developing Chicago's harbor and lake commerce. The plan, which is in accordance with the recommendations of Mayor Busse's harbor commissioners' report, is now being considered by the municipal authorities.

The plan is to effect a joint agreement between the city and private corporations on the principle of the traction ordinances, under which the company will finance and construct the harbor, and the city will derive a percentage of the net receipts and have the right to purchase and operate the business at any time. The plan has assumed such shape that an ordinance embodying these principles will be drafted and introduced into the city council within the next month.

The proposition has taken on additional importance from the fact that the war department is about to grant federal permission for the construction of three piers, which will run nearly half a mile into the lake. In addition, the Chicago interests feel that they will have the friendly aid of the new secretary of war, Jacob M. Dickinson, who takes a deep interest in the development of Chicago's harbor facilities.

TO INSTALL CAGE MASTS.

Secretary of the Navy Meyer has issued a statement in which he says that the repairs which will be necessary to the vessels of the Atlantic battleship fleet, recently returned from the trip around the world, are less than was anticipated.

The statement was occasioned by the extension of the time for the completion of the work on the vessels from May 15 to June 15. Secretary Meyer wished to call attention to the fact that this extension was not necessitated by additional repairs, but was made to enable two new cage masts to be installed ready for the fall target practice.

OHIO RIVER PROBLEM.

Major Henry C. Newcomer, corps of engineers, United States army, who is in charge of the Ohio river, has begun the collection of data to show the amount of water taken from the river at various points for supplying municipalities.

It is believed that the figures will show that the navigation of the river is affected in certain seasons by such use of the river water.

Should it be proven that the use of the river for navigation is being interrupted by the pumping of water supplies to cities, a serious question as to the right of such cities to use water from the river would arise.

NEW CHART OF DETROIT RIVER.

A revised edition of the chart of Detroit River has just been published by the United States lake survey office, old custom house, Detroit, Mich.

The chart is an engraving lithographed in five colors, and shows, on scale of 1:40,000 (1 in.=about ⅝ mile), the entire river from Windmill Pt. lighthouse in Lake St. Clair to Detroit river lighthouse in Lake Erie, with soundings, shore-line topography, and the lights, buoys, and daymarks of the channels.

In addition to the main chart of the whole river, an inset on enlarged scale of 1:25,000 (1 in.=about 2-5 mile) shows the improved channels of lower Detroit river from the head of Ballards reef channel to and including the recently completed up and down bound channels below Detroit river lighthouse, with conditions as they will exist on the opening of navigation, 1909. The lines of the new Livingstone channel, now being dredged in a straight line from the middle of Ballards reef channel to Lake Erie, passing to westward of Bois Blanc island, are also given.

RECORDS OF LUSITANIA AND MAURETANIA.

The following are the records of the Lusitania and Mauretania of the Cunard Line:

"Lusitania"—Queenstown to New York—4 d. 15 h. 0 m. Record for short route, 2,781 knots—best day's run 650 knots and continuous steaming for voyage 25.05 knots. Eastbound record 4.22.50.

"Mauretania"—Queenstown to New York—4 d. 17 h. 6 m. Record for long route, 2,890 knots—best day's run 671 knots. Record for continuous steaming for voyage 25.55 knots. Eastbound record 4.20.27—best day's run 607 knots—average for voyage 25.20 knots.

Plans are well under way for the organization of a permanent waterways association having for its object the union of all interests of the state of New York which might be concerned in the federal development of waterways. A commission, of which Senator Hill, of Buffalo, is chairman, recently held a meeting at Albany for the purpose of making preliminary arrangements. This commission was appointed pursuant to the action of the delegates from New York state at the recent meeting of the National Rivers and Harbors Congress at Washington.

F. C. Stevens, state superintendent of public works, has rejected all bids on contract No. 20, involving an expenditure by New York state of over $4,000,000. Modified plans and specifications are to be prepared before bids are again called for. The contract calls for 58 miles of dredging in the Mohawk river, from Little Falls to Bexford Flats. On three occasions attempts to secure bids failed, but on readvertising for the fourth time two were received, the lowest being $4,913,168, more than 17 per cent in excess of the state engineer's estimate of $4,173,000.

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SHIPYARD NOTES.

William Cryer, of Oakland, Cal., is building a twin-screw towboat 45 ft. long for Peter Nelson & Co., of San Francisco.

Arthur D. Story, of Essex, Mass., has launched the knockabout schooner Russel J. Silveira, built to the orders of Capt. Silveira.

The Tampa Foundry & Machine Works, Tampa, Fla., are to build a dredge to cost $25,000 for the Holder Phosphate Co., of Inverness.

William E. Woodall & Co., Baltimore, Md., recently launched an open lighter for the Piedmont Guano Co. The vessel is 80 ft. long, 24 ft. beam and 7½ ft. deep.

The Vineyard Shipbuilding Co., Milford, Del., is building a tug for McLowery & Co., of New York city. It will be 92 ft. long, 27 ft. beam and 8 ft. 9 in. deep.

The Moore & Scott Iron Works, San Francisco, have a contract for installing oil-burning apparatus in the quarantine steamer Argonaut at an approximate cost of $5,000.

The West Kentucky Coal Co. has completed arrangements for establishing a ship yard on the Tennessee river front at Paducah, Ky. It is the intention of the company to build 500 barges at a cost of $2,400 each.

Sawyer Bros., Millbridge, Me., have obtained a contract for the construction of a four-masted schooner for M. P. Smith & Sons, of New York. She is to be capable of carrying about 550,000 ft. of southern pine.

The British Columbia Marine Railway Co., Victoria, B. C., is reported to have obtained a contract for the construction of two new steamers for the Canadian Pacific Railway Co., for use in the Pacific coasting trade.

Williams Bros. & Alexander McDonald, of Long Branch, N. J., are building a 100-ft. power yacht for H. N. Baruch, of the Atlantic Yacht Club. She will have a beam of 17 ft. and a depth of 4 ft. 6 in.

The Bath Iron Works expects to have the steel turbine passenger steamer Belfast ready for her official trial by May 15. It is expected that she will display slightly greater speed than her sister ship.

The Moore & Scott Iron Works, San Francisco, Cal., are progressing rapidly on the repairs to the government tug General McDowell, and it is expected that they will be completed well within the 18 days allowed by the contract.

R. L. Bean, Camden., Me., will soon launch the three-masted schooner building for Capt. Samuel W. Theall, of Boston. As soon as she is off the stocks work will be begun on a somewhat larger three-master for Capt. William Nelson, of Lyndon, Mass.

C. Durm & Sons, Baltimore, Md., have been awarded a contract for the construction of a composite Ketch cruising yacht to be 60 ft. long and of steel frame construction. She will be fitted with a gasoline engine of considerable power.

The Verdon Co., New Brighton, S. I., N. Y., are building a steam lighter for the M. J. Rudolph Co., Inc., of New York, which is to be 106 ft. long, 29 ft. beam and 10½ ft. depth of hold. She is to be used for supplying coal and water to yachts and the general shipping trade.

The Moore & Scott Iron Works, San Francisco, Cal., have recently installed a large Scotch marine type donkey boiler on the oil schooner Rhoderick Dhu, which is owned by the Associated Oil Co., of San Francisco. The boiler was built by the Moore & Scott Works.

The Portland Shipbuilding Co., Portland, Me., is erecting a building 80 x 30 ft., for use as a machine and engine plant. J. C. Noyse has been appointed to take charge of the new branch. He was formerly connected with the Bath Iron Works, Bath, Me.

Robert Crawford, Tacoma, Wash., is soon to begin the construction of two craft, one an auxiliary fishing schooner for Seattle owners, to be 42 ft. in length, 10 ft. beam and 6 ft. deep. The other vessel is to take the form of a floating grocery store and will be 50 ft. long, 14 ft. beam and 4 ft. deep.

William R. Osborn, Croton-on-Hudson, N. Y., has been awarded a contract for the construction of a 55-ft. light-draught wooden tug by R. G. Davis, 454 48th street, Brooklyn, N. Y. The tug is to draw not over 5 ft. of water when coaled and equipped for work. She is to be launched on or before April 1.

The Newport News Shipbuilding & Dry Dock Co., Newport News, Va., is making excellent progress on the construction of the torpedo boat destroyers Roe and Terry, the keels of which were laid some time in December, 1908. On March 1 the Roe was 17.1 per cent completed and the Terry 16.7 per cent.

The Risdon Iron Works, San Francisco, Cal., are making good progress on the repairs to the steamship Sampson. A cofferdam has been built about the ship in order to get at the rivets in the bulkheads below the water line. This was necessitated by the lack of dry docks in San Francisco other than those controlled by the Schwab interests, and which are not obtainable for use by other firms.

The Mosher Water Tube Boiler Co., 1 Broadway, New York, is making a strenuous effort to get the award for furnishing boilers for the new battleship Florida. The bid of the Mosher Co. was $69,000 lower than that of the Babcock & Wilcox Co., who bid $243,000 for the installation. The disposition of the navy department is to award the contract to the latter firm as its boiler is exactly suited to naval purposes. The Mosher boiler has never been installed in a battleship and would therefore be more or less of an experiment, although it has been tested in torpedo boats of the United States navy. The Mosher boiler is on the Yarrow principle.

The Newport News Shipbuilding & Dry Dock Co., Newport News, Va., laid the keel of the steamer which it is to build for the Matson Navigation Co., of San Francisco, on March 15. This steamer is to be 450 ft. in length and will cost $800,000. She will ply in the sugar trade between San Francisco and the Hawaiian Islands. She will be fitted with passenger accommodations also, will carry 6,000 tons of freight and is to make a speed of 15 knots.

The Maryland Steel Co., Sparrows Point, Md., will probably launch the first of the three colliers which it is building for the navy department early in April. Practically all the frames are up, the bulkheads are in and the hull plating remains to be finished when the Mars can be put overboard. The Venus will probably be the second one to be launched and she will be followed a month later by the Hector.

H. S. Groves, president of the William Cramp & Sons Ship & Engine Building Co., of Philadelphia, sailed for London recently for the purpose of negotiating concerning the contracts which are about to be awarded by the Argentine republic for naval vessels. The order involves contracts to the amount of $20,000,000, and if obtained for the Philadelphia yard will be one of the biggest undertakings in the history of the plant.

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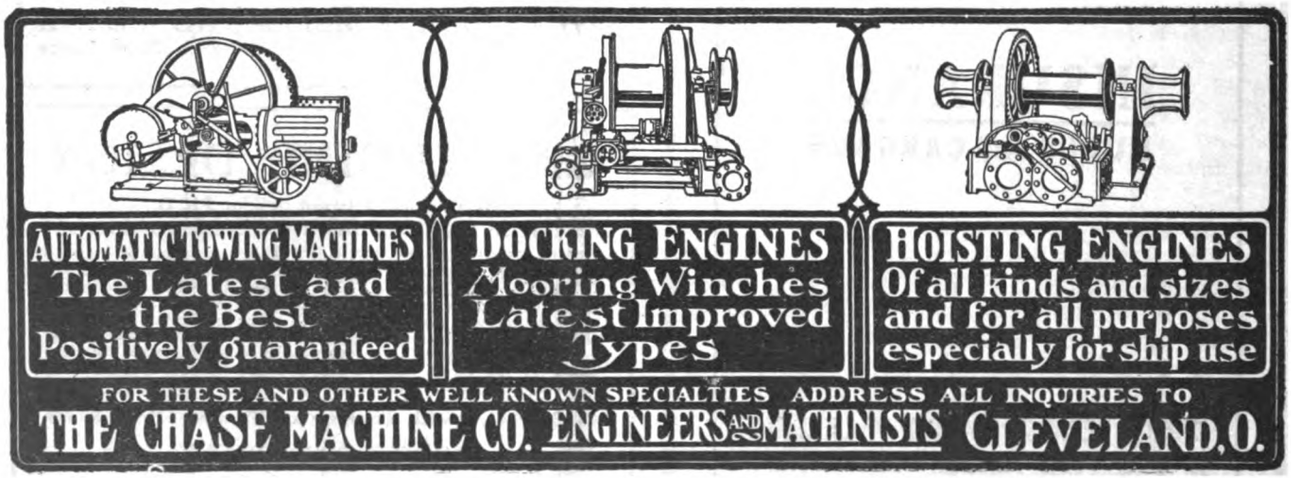

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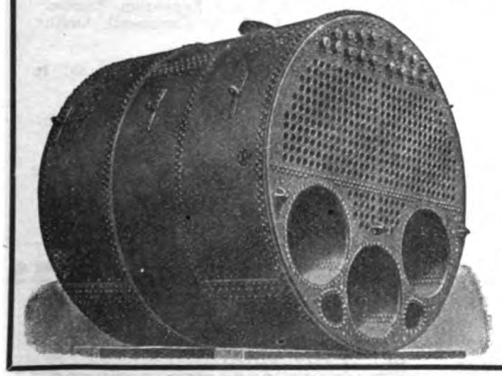

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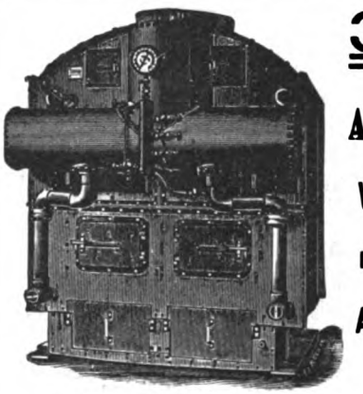

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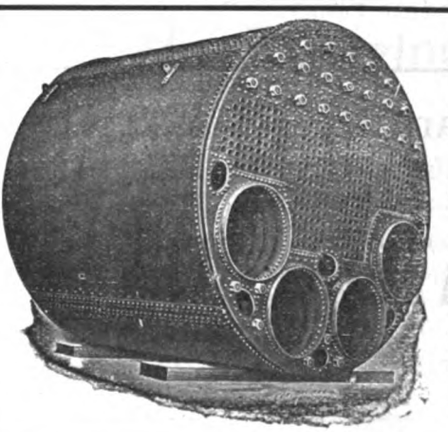

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U. S. ENGINEER OFFICE, WILMINGton, Del., March 12, 1909. U. S. steam yacht Adele (length 76 ft., draught 6½ ft., about 70 I. H. P. and 18 net tonnage) will be sold at public auction at noon April 12, 1909, on upper side at foot of Fairmount avenue, Philadelphia, Pa. Same can be seen there from April 5 to time of sale, and before then at Pusey & Jones Shipyard, Wilmington, Del. Terms, one-quarter cash at time of sale, and remainder within ten days thereafter, on delivery of boat. Quarter payment will be forfeited if remainder is not paid within the ten days, and boat will then be sold again. L. H. Rand, Capt., Engrs.

U. S. Engineer Office, 57 Park St., Grand Rapids, Mich., March 15, 1909. Sealed proposals for Repair of North Pier at Manistee, Mich., will be received here until 3 P. M., April 14, 1909, and then publicly opened. Information furnished on application. Charles Keller, Maj., Engrs.

U. S. Engineer Office, Buffalo, N. Y., March 15, 1909. Sealed proposals for constructing stone breakwater at Buffalo Harbor, N. Y., will be received at this office until 11 o'clock A. M., April 15, 1909, and then publicly opened. Information on application. W. L. Fisk, Colonel, Engineers.

U. S. Engineer Office, Detroit, Mich., Feb. 27th, 1909. Sealed proposals for the construction of the superstructure of a movable dam for St. Marys Falls Canal, Sault Ste. Marie, Mich., will be received at this office until 3 P. M., March 30, 1909, and then publicly opened. Information on application. C. McD. Townsend, Lieut. Col., Engrs.

Sealed Proposals will be received at the office of the Light-House Engineer, Buffalo, N. Y., until 11 o'clock, A. M., March 30, 1909, and then opened, for furnishing materials and labor of all kinds necessary for the construction of a light-house and an iron beacon at the entrance to Cleveland Harbor, Ohio.

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FOR SALE. ENGINE. U. S. Engineer Office, Vicksburg, Miss., Mar. 13, 1909. Sealed proposals for the purchase of a quadruple expansion, 125 horsepower condensing engine will be received here until 12 o'clock, noon, April 30, 1909. Information on application. Clarke S. Smith, Capt., Engrs.

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Griscom-Spencer Co., New York, N. Y.
Great Lakes Dredge & Dock Co., Chicago, Ill.
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